40 Rock (c)

POPULAR Computing WEEKLY

35p 4-10 August 1983 Vol 2 No 31

This Week

★ STAR
Marshy Maze on Dragon. See page 10.
GAME ★

News Desk

Spectrum tops ½ million mark

SINCLAIR has announced that sales of the ZX Spectrum in the UK and Europe have now exceeded 500 000

This is an average of more than 6,500 a week Of the two models available, the larger memory version has dominated — with the 48K outselling the 16K by about two to one

On breaking the half-million barrier Sinclair's managing director Nigel Searle said "Of course we are delighted And we hope that peripherals like the ZX Microdrive announced last week, and the Rom cartridge software we aim to publish in the autumn will keep that user group challenged by their Spectrums"

The Spectrum has in fact been more successful than the ZX81 comparing corresponding 16 month periods from launch The ZX81 sold just over 400 000 units for the period to July 1982

Home turn-on for Aquarius

A UNIQUE computer add on has been announced by Mattel for the Aquarius home computer, which will enable the machine to control household electrical appliances

Called the Home Control System it allows lights, central heating, or any other mains-operated device, to be operated remotely at predetermined times, without any additional wiring having to be installed

It works by using a special control unit which plugs into any mains socket which then communicates with appliances, each connected using special plugs by sending high frequency coded signals through the existing mains wiring

To set up the system to switch on or off a particular appliance at a particular time the Home Control Unit has to be programmed — using an Aquarius microcomputer

The unit — a small device about the size of a thick paperback book — plugs into the

Continued on page 5

Continued on page 40

★ ★ WIN A LYNX — SEE PAGE 37 ★ ★


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SIX GREAT NEW PROGRAMS FOR THE DRAGON 32
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41 TRURO ROAD, ST. AUSTELL
CORNWALL PL25 5JE.
TEL: 0726 3456



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The Team

Editor
Brendon Gore

News Editor
David Kelly [01 930 32 1]

Software Editor
Graham Taylor [01-839 2504]

Production Editor
Lynne Constable

Editorial Secretary
Caroline Owen

Advertisement Manager
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Advertisement Executive
Alastair Macintosh [01-930 3260]

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Managing Editor
Duncan Scot

Publishing Director
Jenny Ireland

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Articles which are submitted for publication should not be more than 3 000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should whenever possible be computer printed.

We cannot guarantee to return every submitted article or program so please keep a copy. If you want to have your program returned you must include a stamped addressed envelope.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week

Editorial

What makes a good computer game? There is no simple answer, since people's tastes differ, but there are a number of qualities that seem to be present in most successful games.

One of the most important elements in computer games is their addictiveness. The desire to play a game again and again is a hallmark of its quality. Any game which elicits the response "Just one more go and I'll get on to the next level ... set a new high score ..." is likely to be successful.

As a corollary to the quality of addictiveness, good computer games tend to be progressive, ie, they get harder as you go along. A game which only has one level of play tends to become boring as soon as you have mastered it.

Another important element in judging the quality of a computer game is its simplicity. This is not to say that sophisticated games are bad, just that they should be easily comprehensible.

Funnily enough, all of these qualities depend on the design of the game rather than the programming skill which goes into it. Even the most amazing use of graphics and sound will find it hard to rescue a poorly designed game.

Perhaps the key to designing a good computer game is the recognition that it requires both programming knowledge and an understanding of the mechanics of game construction.

Next Thursday

Manoeuvre the green blocks around the screen and try and get the sun down to the bottom. But don't let the clouds fall through the gaps. Sunfall for the 16K or 48K Spectrum by Jonathan Medhurst.

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GRIDRUNNER
£7.95
By the year 2190 the Earth is a barren and desolate wasteland. With all natural resources used up, the human race's last hopes rest with a huge orbiting solar power station known as GRID. Now the GRID has been invaded by a race of evil droids from Frogfax V, intent on the total subjugation of Earth. To combat these droids, an incredibly powerful and manoeuvrable ship, the Gridrunner, was developed. Your mission: stop the droids and save the Earth!
Gridrunner is an arcade game requiring one joystick.
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Bundles of ZX81 starter packs

SINCLAIR is now doing to the ZX81 what Commodore has done to the Vic20

As of August 1, the machine will be available as part of a special package deal This Sinclair Starter Pack, as it is called will include a ZX81 a 16K Ram pack and one software cassette — all for £45

This price is a £30 saving on the cost of buying the three components separately To begin with the software cassette on offer will be Psion's *Backgammon* title But other titles will be available as well with shops receiving a random selection

The reason for the deal is that the price drop of the ZX81 earlier in the year to £39 95 has failed to revive flagging sales of the machine

Initially the offer will run for two months and the Starter Packs will be available from most usual stockists including Boots and John Menzies

In another offer running concurrently with the Starter Pack scheme Sinclair is offering a free pack of five rolls of printer paper with every ZX Printer sold between now and the end of September

Just a war game

WARGAMES which opens in London this week is the latest film to be inspired by the micro

Its teenage hero David Lightman has one interest in life — the world he can access over the telephone lines with his home computer But along the way he accesses the American defence system — and the game he has found that seems like *Space Invaders* is in fact a whole lot more!

Frightening, but not impossible Last year three New York school children used their computer to crack the code used by Pepsi Cola to control its Canadian freight movement In a few days they had placed huge orders from fictitious companies and delivered empty bottles to subsidiaries all over Canada

The joke cost Pepsi a fortune and, when the culprits were eventually tracked down by the Californian police and the FBI the three — being minors — escaped prosecution

For a more weighty discussion of such real-life incidents see *Computer Insecurity* by Adrian Norman, published by Chapman and Hall

Aquarius

Continued from page 1

mains and also connects to the cassette port on the computer A Rom cartridge provides the programming software to set up the codes of each appliance to be controlled and to set on and off times For lights there is also a dimmer facility Having programmed the unit the Aquarius is no longer needed and can be disconnected

Up to 256 appliances can be controlled from the system, each being programmed with up to 32 on/off events over a seven-day cycle

The Home Control system has been developed by BSR/Pifco in Scotland in conjunction with Mattel It is expected to go on sale in early 1983 and prices will be around £100 for the controller and software and around £10 for each of the special plugs needed for each appliance

Mamory expansion

QA Data Systems has announced a mother-board and memory expansion module for the TI 99/4A machines

The unit, which plugs into the data bus at the side of the machine, has 32K, four expansion sockets and its own power supply The module will be available in August at a price of around £200 This compares with an equivalent package from Texas Instruments costing £159 95 for a 6-slot motherboard and power supply plus a further £159 95 for a 32K Ram expansion

QA Data Systems can be contacted at 9 St Georges Street, Chorley, Lancs

Dragon and Oric dumps

PROGRAMS to allow users to make high-resolution screen dumps to a printer are now available for both the Dragon and Oric

The Dragon program is from Caveman Computers, costs £7 95 and works with the Seikosha GP100A and Tandy DMP100 printers with an Epson version to follow

The Oric package is from Peach computers and comes in two forms — producing either a 40 or 80 character per line high-resolution dump of the Oric's 240 × 200 screen Both versions cost £5 and should work with most Centronic interface type printers, including the Epson range

Contact details Caveman Computers 55 Iona Road, Windy Nook Gateshead, Tyne and Wear and Peach Computer 192 Greenock Road, Largs Ayrshire

Cards on the table

U-COMPUTERS – better known for its plug in cards for the Apple – has now turned its hand to the Spectrum

To begin with the company has produced a 3-slot buffered expansion board (£35 65) and a 4-slot extension board – allowing a maximum of seven additional boards to be connected

Among the expansion cards being offered is a dual RS232 board (£34 50) and a general purpose parallel port board (£29 90)

A further five cards are still at the design stage

Details from U-Computers, Winstanley Industrial Estate, Long Lane Warrington Cheshire

Two more CBS deals

CBS Records has announced two more distribution deals in addition to its Quicksilva deal announced last week (see *Popular Computing Weekly*, July 28)

CBS has now agreed to distribute software produced by Virgin Games and Rabbit Software

Court movas for Commodore

COMMODORE is considering taking legal action against the General Hardware Company which is selling a device to allow Rom cartridge software for the Vic20 to be broken into and copied (see *Popular Computing Weekly* July 14)

A spokesman said "We are very concerned and the matter has now been referred to our solicitors who are considering the next move

Possible court action has been made considerably easier by a legal precedent set earlier this year in the business sector Dataview successfully challenged FAW Electronics which was manufacturing a switch — *Masterkey* — which could be encoded to disable Dataview's dongle software protection code The breakthrough came after Dataview claimed that the dongle breaker had only one use "to induce a breach of contract between supplier and customer

LETTERS

A fifth level

Did all you 48K Spectrum owners know that the game *Penetrator* has a fifth level? It seems when in the training mode the computer asks 'level (1 to 4)" I entered 5 and found a new sheet

At one point in this sheet there is an impassable mountain which always destroys your ships but there is also a way of getting 1000 extra points Maybe this sheet was written and, because of a bug, discarded I'll keep you guessing about the 1000 points

Steven Wilson
64 Sudbury Court Drive
Harrow
Middx HA1 3TD

Paying the price

May I take the opportunity to reply to Ziggurat in *PCW* 14 July, Vol 2 No 28 issue?

Mr Allan went to great lengths to complain about the cost of software in relation to the cost of blank cassettes As a producer and seller of software we can appreciate his point of view, given the price of software and blanks available over the counter To the end user the £5 or so must seem a bit of a rip-off In fact this same attitude was the catalyst in the formation of our own company, and many like us

Now let us examine the facts as they exist and not just the end prices Tape duplication — this is the first point at which the software house incurs expenses Most duplicators will charge for tape mastering This can cost anything from £15 to £40 or even more For this, the duplicators make a copy, by various means, of the tape you supply to them. Most of the 'reputable' duplicators also have minimum run requirements, which on a new title becomes a possible liability to the software house — this will become clearer later on

OK, so now we've got the mastering charge, and, surprise, surprise, carriage charges for delivery of the duplicates Next on the shopping list are labels Unfortunately, the end user is solely to blame for this aspect, as they are unwilling to buy software which is packaged as cheaply as possible We have experience of this, and have had to introduce full colour, double flap, cassette inlays

Here is where the cost hits RAMtop — 'readily available money To produce the inlays which the customer expects, commercial artists are set the task of producing artwork, after which printing plates must be made These plates one for each of the four colours used, are made of metal and produced by a photographic etching process, very specialised and very expensive

Next comes the actual printing It is true that the cost of a label is small, but this is only for the printing The average cost for actually taking the plates from a drawer and fixing them into a printing press is about £300

OK now we have inlays and duplicated cassettes Next, we need labels on the cassettes themselves, these being printed with title of program, company logo, machine type, etc There will be a cost for producing the artwork and minimum runs

If your bank balance is still alive you now have a finished and saleable article — not so fast! Who in their right mind is going to buy your software, when they can open any magazine and see nice full colour, full page advertisements for the ultimate playable software of the 'universe' available from the large chain stores — it must be good!

So it's obvious that advertising will play an important role in the success of your software

Advertising is not free — the average cost of a quarter page advertisement in black/white is £130-£160 per insertion (week, month) Colour advertising is astronomical

So now we are advertising but users still cannot buy it over the counter So, you must rely on retailers seeing the advertisement, mail order, and your trusty GPO telephone to muster sales To get known by the retailers and wholesalers, you must now give away your software as samples — some return eh!

You can disregard the retailers to some extent, as they prefer to buy from wholesalers So, let's concentrate on the wholesalers They will require something like 50-60 percent discount, so after all this the £5 cassette is only worth £2 50 to you, less all the other expenses and less all the freebees you've given away, postage of samples and review copies, which are *never* reviewed, etc

I have not yet mentioned travelling the country attending computer fairs and exhibitions, where stands can cost anything up to £500 (plus VAT)

And, if you don't get your software into the big chain stores, then your overpriced software, which only represents the cost of a blank, will never get into the 'Top Ten' and must therefore be below the standards set by the cheque books of the 'big boys'

If the buyer would purchase plain, wrapped, unadvertised software by mail order for £2, then it would become available But they won't, so they must pay the price for being wooed by exciting inlays, colourful advertising and over the counter availability

D Wieckowski
Elephant Software
41 Haymill Road
Burnham
Berkshire SL1 6NE

Cured eye strain!

I would like to thank Brian Cadge for his Dragon screen invert program (*PCW*, July 14) — eye strain cured at last!

I now load this program, on start-up, as a matter of course Such constant use has revealed a minor problem any attempt to execute a *Get* command, with the code in memory, results in a *Syntax Error*, at least, this happens on my Dragon

The following changes will give a green on black screen on Running change *'D'* in line 30 to '5' and change checksum in line 60 to '17097

I've also found the following additions of benefit

```
80  PRINT  INVERTER-COURTESY
    OF BRIAN CADGE"
81  PRINT@32 STRINGS (8 186)
82  PRINT PRINT  ORANGE TEXT
    IS ALSO AVAILABLE
85  PRINT  DO YOU REQUIRE
    THIS? (Y/N)"
100 X$ = INKEY$:IF X$ = "" THEN
    100
110 IF X$ = "Y" THEN POKE
    32844 18
116 PRINT PRINT  THE BASIC
    PROGRAM WHICH LOADED
    INVERTER IS NO LONGER
    NEEDED 187 BYTES ARE RE
    SERVED AT RAMTOP"
120 PRINT PRINT  MAY I DELETE
    PROGRAM? (Y/N)
130 Z$ = INKEY$:IF Z$ = "" THEN
    130
140 IF Z$ = "Y" THEN CLS NEW
150 PRINT PRINT  AWAITING IN-
    STRUCTION"
160 END
```

Dave Vaughan
105 Tollohill Drive
Kincorth
Aberdeen

300,000 in seconds

I am writing to tell you of a bug I have discovered in Microdeal's *Donkey King* program for the Dragon 32 — you can get 300,000 points in a matter of seconds

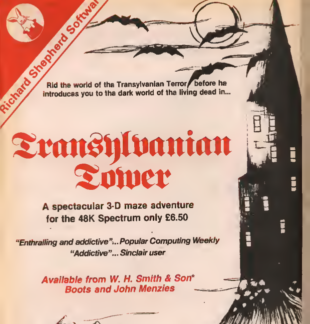
All you have to do is, when your first man appears, have your button already pressed and your joystick pointing right Jump until you are just before the second ladder and then climb it Take one further jump to grab the hammer and fall off the end When your next man appears you will have exactly 300,000 This only works with player 1's first man

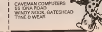
Also, I would like to ask about the rates paid out by software companies as I am now just finishing my own game loosely based on *Galaxians* called *Datacc* It is in machine code with full sound, saveable hall of fame and nine colour graphics in Alphasemigraphics mode 24

Stephen Quail
158 Parkhills Road
Bury
Lancs

Typically, you can expect to receive either a flat-rate cash fee, or a royalty payment. The royalty may vary according to sales, but should be in the region of 7-12½ percent of the retail price. If you are offered a massively larger royalty, it will be at the expense of a proper marketing and promotional campaign.

NB When you submit your game, I would include a clause in the letter stating that you reserve the right to offer the game elsewhere if you do not receive a reply within three weeks.


Richard Shepherd Software
Rid the world of the Transylvanian Terror before he introduces you to the dark world of the living dead in...
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"Addictive"... Sinclair user
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CAVEMAN COMPUTERS
55 IONA ROAD
WINDY NOOK, GATESHEAD
TYNE & WEAR

Marshy Maze

A new game for Dragon 32 by Kevin Whitley

Marshy Maze for the Dragon 32 is an exciting maze-type game. The objective is to guide your man along paths in the maze, with the help of a joystick, to enable you to reach home. But, if you stray from the path and enter the marsh you will be eaten by crocodiles and lose a life.

You have a total of 12 lives with which to complete four different mazes. Each maze is more difficult than the preceding one.

Just to make things more difficult, you only have a limited amount of time in which to complete each maze. Again, if you fail to complete a maze inside your allotted time, you lose a life.

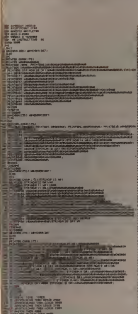
NB Lower case letters in the listing denote inverse characters.

Lines

1-7	Goto instructions
8-80	Set up variables
90-240	Set up first maze
500-670	Set up second maze
1000-1210	Set up third maze
1500-1710	Set up fourth maze
2000-2040	Goto Movement
2052-2058	Check if you made it
2060-2080	Check timer
2090-	Returns to Movement
2500-2840	Movement
4000-4030	Prints you have fallen into the marsh
4200-4250	Prints men left
4300-4330	Prints ran out of time
4500-4550	Prints you succeeded on this maze
4700-	Returns to print maze
4800-4870	Prints no men left
5000-5060	Prints you succeeded all the mazes
8000-8010	Checks timer for screen four
9000-9010	Checks timer for screens one, two and three
9500-9710	Prints instructions

Variables

S = Scores
M = No of lives
X = Maze No
S1 S2 S3 S4 = Current scores
C$ W$ = Maze blocks
A = Position of player



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In addition, an RS-232 input is provided which opens the way to a full Communications System with applications too numerous to list fully Many interfaces are now in use with VDUs, electronic typewriters plotters development systems and main-frame computers or simply exchanging information with other SPECTRUMs Other applications include sharing a parallel printer between several SPECTRUMs using the serial link to transmit the data

★ **THE WORD PROCESSOR** TASWORD TWO, the incredible piece of software that gives an amazing 64 characters per line on your screen This is ideal for standard A4 paper and prints your text as it appears on the screen

Text justification programmable left and right margins, global search and replace Block move and Block copy programmable printer control codes etc are only some of the features of this — true value for money — program

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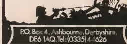
SHUTTLE (Microdeal) Tom Mix's ultimate flight simulation complete with satellite captures sequence in orbit £8 00

GRIDRUNNER (Salamander) Jeff Minter's chart topping machine-code hit is now available for the Dragon £7 95

NINJA WARRIOR (Programmers Guild) Best selling arcade game prior to the arrival of GRIDRUNNER Can you achieve black belt status in the Martial Arts? £8.95

CUTHBERT GOES WALKABOUT (Microdeal) Great graphics great sound great arcade game! £6 00

OTHER TOP SELLERS:
THE KING (Microdeal) £8.00, **CRUISING** (Sunshine) £8 95 and (as always) **RING OF DARKNESS** and **PIMANIA** £10 00



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Address

PICTURE SPECIAL

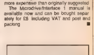
Up to eight Microdrives may be connected to a single Spectrum, complete with ZX Interface 1, for a total capacity of 680K bytes

Each Microdrive cartridge (shown here with case) can store up to 50 files — with an access time of 3 5 seconds

The Microdrive was officially launched in London last Thursday but it will not be available in the shops for some months yet

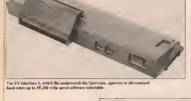
Mail order Spectrum customers have already been sent letters about the Microdrive — the earliest customers have even been sent order forms

Manufactured by Thorn EMI Datatech the Microdrive costs £49 95 and includes a free demonstration cartridge The ZX Interface 1 costs £29.95, if purchased with a



Microdrive — £49 95 if bought on its own Blank cartridges at £4 95 each are rather more expensive than originally suggested

The Microdrive/Interface 1 manual is available now and can be bought separately for £6 including VAT and post and packing ■



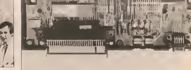
The ZX Interface 1, which fits underneath the Spectrum operates at all standard baud rates up to 19,200 with speed software selectable



The Microdrive is connected to the Interface 1 by a Microdrive lead Powered by the Spectrum's power supply, a red indicator light shows when the Microdrive is running



Mircodrive designers (clockwise from bottom right) David Southward, Martin Brennan, John Williams and Ben Cheeze.



Inside the Interface 1 showing the expansion bus, Microdrive and RS232 connectors

Printed information

***Stephen Adams** looks at a ranga of printer interfacas for both ZX81 and Spectrum*

All the interfaces reviewed here are based on a standard set for centronics printers. This is a method of connecting up a parallel port and a printer to send eight bits of information at a time.

The interface to the printer has a common plug (a 36-way Amphenol type plug) which carries eight data lines, Strobe, 0 volts, various protection earths and control signals. The other end of the ribbon cable which connects the two, may be completely different depending on how many of the extra lines are used or checked by the interface. This means that any centronics standard printer may be plugged into the interface, but that some of the extra features of the printer may be unobtainable, eg Paper empty, Initialise, Error detection, etc.

The connections to the printer include a Strobe line which is used to indicate to the printer when data is ready for collection (see Figure 1). Every time this line goes to 0 volts, there is a new set of data bits on the data lines for the printer. Two further connections are used by the printer to signal to the computer that it cannot accept any more data.

The printer is a very slow device compared to the speed of the computer — it is necessary to check that the transfer of data continues at the speed which the printer can accept. This method of telling the printer when data is ready (via the Strobe line) and the printer telling the computer when it can or cannot accept any more data (via the Busy or Ack lines) is called handshaking.

The Busy line goes to +5 volts immediately on receiving the first Strobe pulse and only returns to its normal state (0 volts) when all the printing operations have finished. If the computer contains a Ram chip as a buffer to store incoming data before printing, the Busy line will revert to its normal state quicker as the data is printed later.

Figure 1

The Acknowledge line goes low for a short time at the end of the printing period. Therefore the computer has to constantly monitor this signal, as it will only be there for a short period of time and does not change immediately data is sent. This is one of the reasons that the Busy line is often the only line checked by the interface software. See Figure 2 for details.

All of the printers that use the centronics standard also have another common feature — the Ascii character set. This defines the letters, numbers and symbols used inside the printer from 0 to 127. Codes 128 to 255 are ignored by the standard, but many of the printer manufacturers have used the codes from 128 to 255 (the maximum number on an eight bit byte) to implement graphics and other features.

The character codes from 0 to 31 also have special significance, as they are used to control the printer mechanism itself and are called control codes. These do things like double height or width characters, underlines, high-resolution graphics and a host of other tricks. Again, these are not exactly standard and must be put out by the software controlling the interface.

The same character codes may be completely different inside the computer, so the printer software often has to make restrictions on the sort of code it can handle. The ZX81 printer interfaces also have to convert the ZX81 character set to Ascii. The software is often stored on tape, which means that it must be run in before the programming session starts. But, once there (assuming no crashes occur requiring the user to reset the machine), it will not need to be *Loaded* with every program.

Figure 2

The software is usually stored above Ramtop at the top of memory — you must ensure that this does not clash with your own programs. No problem should be experienced with the Memotech (ZX81) or Euroelectronics interfaces, as both are Rom based in an area unused by the basic system.

Three commands are built into Basic for use with the printer — *Lprint* which prints out characters contained within the inverted commas, *List* which automatically goes through the program listing the lines on to the printer and *Copy* which makes a complete dot by dot copy of the image of the screen on to the printer.

Any formatting of the printed page must be done through the *Lprint* command (new line, double width, etc).

The Memotech interface comes in the same package as their Ram packs, with a socket at the back to take a 34-way IDC (insulation displacement connector) plug. Pin one is identified by a coloured stripe on the wire. The ribbon cable has to go under any of the other Ram packs etc to the printer. The only other signal beside Busy and Ack is the Error signal. The interface is based on the Seikosha GP100 printer.

The software is placed in a 2K Rom starting at 10K, so the 64K Ram pack is limited to 48K with this device. This interface can only handle text (letters and numbers) and not graphics, as anything outside this range must be prefixed by a chr$(155) which is an inverse dot.

An alternative to prefixing everything with chr$(155) is to put control characters into a Rem statement at the beginning of the program and calling the interface direct by using *Lprnt* chr$(6). No characters outside the range 0-127 may be sent to the printer.

The instruction booklet that comes with the interface is very good, but not infallible. The user will have to write a lot of control characters in his program to get it to be anywhere near as useful as the Sinclair printer. But this printer does have two advantages — one, that no software needs to be *Loaded* before using it, and two, that all the commands use the same Basic commands as Sinclair.

To use the Pericon c module, you must first have bought the Persona and a Ram pack (at least 16K) from Basicare, as it is not compatible with any other part of the system except the computer. The module comes with a tape which allows you to

change the type of printer from Serkosha to an Epson for the graphics print-out. All of the printer commands are via *Usr* (address) calls to the machine code above Ramtop Instead of using machine code, you can *Poke* the number of the character you want into the port at address 48129 and check the signals from the printer (Busy Ack, Paper empty and Select) on port address 48130

The *Lprint* is implemented by filling up string B$ with your message which is then converted to Ascii (inverse characters for lower letters again) and sent to the printer The machine code uses up about 1K of your 16K Ram and is run in from tape which auto-runs The printer interface is via a 26-way IDC connector on the back

Amber has produced a very small 2½-inch-wibe plain paper printer Since it does not use a standard centronics interface (a 25 way 'D socket is used) Amber has produced its own interface The board comes with a plug on it for the printer, cable and pcb interface to plug into the ZX81's expansion port No program is provided on tape, though one is *Listed* in the instructions to convert ZX81 codes into Ascii (in Basic) The output to the printer is via a 16-byte machine code placed above Ramtop You will have to write your own *List Lprint* and *Copy* routines as the programs given only allow you to output single bytes Ascii codes 0-127 are used — eight-bit codes are only used after a control character to produce graphic dots on a line and there are only 24 characters per line

The Euroelectronics *Lprint* interface consists of a low flat black plastic box which plugs into the expansion port at the back of the Spectrum It has no extension pcb so all other devices must be placed between it and the computer

The box contains a Rom for all the routines (it sits in a spare Rom space), except *Copy* which is available on tape as an optional extra *Lprint* will ignore graphics both user definable and Sinclair, as well as underline *Lprinting* chr$(5) before any set of characters allows any code to be sent to the printer direct and many to be turned off with chr$(4)

On *List* it does not recognise a 32-column format but goes on to print out until a new line is reached either on the printer or on the Listed line This tends to make a mess of listings

The 'lazy man's' printer interface, it has the advantage of being there when you switch on (no tape to *Load*), but it is inflexible about graphics CR, etc, so the user will have to write routines in Basic or machine code to get round this It is also expensive

The Kempston interface was one of the first to arrive on the scene for the Spectrum and provides all the facilities of *Lprint* and *List* via a short machine code routine This routine can be "customised" by a Basic program supplied to suit any type of printer All the output codes can be changed and, as graphics are not printed, you can redefine them to print as spaces (for filling in later on by hand)

The machine code is located above Ramtop and is *Loaded* in by using *Code* after modifying it with the Basic program This saves memory as only the machine code needs to be *Loaded* Both 16K and 48K versions are provided on the one tape *Tasword* is one word-processing program which uses this interface to print out on a full-sized printer

A very useful interface, very flexible and simple to use Most non machine code programs will run without any alterations using a full-sized printer

The Morex interface has both centronics and RS232 interfaces which drive printers and other equipment The centronics side works very well and includes a *Copy* command called by *Rand Usr* Software is fully explained and again run in from tape above Ramtop You can set the CR/LF option via a *Poke*, but not line length Graphics, etc, are printed as "?

Much of the explanation in the instructions refers to the RS232 input and output port, which I could not get going with a printer It is supposed to allow you to transmit and receive between 4800 and 50 baud giving you a wide range of speeds

This would be well worth buying if you were thinking of using a printer and modems or other devices using the RS232, as you get two devices in one

Hilderbay wrote the software for Kempston's printer and has decided to bring out its own version of the interface with some more software in a different box to Kempston's, but with the same 'customising' software, plus a free word processing tape, Hilderbay's interface is just as useful as Kempston's

A good product backed-up with good software and service It is flexible enough to be incorporated into most programs ■

Firm	Micro	Price
Amber Central Way Walworth Industrial Estate Andover Hampshire	ZX81/Spectrum	£24 80
Basicare 12 Rickett Street London SW6	ZX81	£41.76
Euroelectronics Ziln House Oakfield Street Cheltenham Glos GL50 2UJ	Spectrum	£53 48
Hilderbay 8-10 Parkway London NW1	Spectrum	£45
Kempston 180a Bedford Road Kempston Bedford MK42 8BL	Spectrum	£45
Memotech 3 Collins Street Oxford OX4 1XL	ZX81	£41.[illegible]
Morex Peripherals 2 Balliol Road Caversham Heights Reading Berks	Spectrum	£35 95

*All prices include VAT and cable to printer


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Space explorer

Maurice Gavin explores the Solar System with the aid of his 16K Spectrum

Fancy a trip to real worlds via your computer without the empty fantasy of yet more space games? Now you can with the astronomy program for the 16K Spectrum. It enables you to "view" the Solar System as seen from the "skies" of any planet including Earth, and for any date. You can even defy the mythical Icarus by "viewing" the planets from the surface of the Sun or perhaps from Jupiter during a space-craft's fly-by.

The program contains all the necessary data to compute the various planetary positions (ecliptic longitude), the constellation in which each planet appears and the angular separation from the Sun (solar elongation). This is displayed in both table and graphic form — the latter as a 360° panoramic strip of sky centred on the Sun. The computation and display take but a few seconds and are deliberately slowed down to make the information easier to assimilate. Good use is made of the Spectrum's colour and graphics and an option to *Copy* the screen via the ZX printer is included.

The initial display lists the planets and *Draws* the orbits to two scales — one for the Earth-like "rock planets" Mercury to Mars and one for the remote and "giant gas planets" Jupiter to Neptune. Despite the program's simplicity it is sufficiently accurate for you to identify the planets as seen from your back garden. This naturally assumes you choose Earth as your view point and *Input* a current date with a clear evening. A star atlas like Norton's will be useful in finding the constellations.

The exceptions to this are the remote planets Uranus, Neptune and Pluto which are all too faint to be seen without a telescope and even then are indiscernible from the stars. Pluto is excluded from the program because its orbit is highly elliptical and inclined 17° to the general plane of the planets called the ecliptic. Circular orbits of zero inclination are therefore assumed — Mercury and Mars prove the least accurate but only so over long periods of time.

The results of a program of this type are called ephemerides and it may be of interest to discuss the principles behind them.

A plan of the Solar System could be likened to a giant clock with eight hands of varying length — the outer tip of each hand representing a major planet. Each hand will sweep-out the same area (shown shaded in Fig 1 and 2) in the same time interval. Thus planets progressively further from the Sun move more slowly and take longer to complete an orbit.

Knowing the position of the planets on an epoch, or reference date, it is only necessary to wind the hands backwards or forwards to locate the planets on any other date — past, present or future. If your viewpoint is the Sun, each planet will appear projected onto the background constellations ie Signs of the Zodiac equal to the planet's heliographic (Suncentred) longitude. If your viewpoint is a planet then the computer performs the necessary triangulation to deduce the revised positions.

The Rem statements show the general structure of the program with the *Data* held from Line 1000. This program was originally designed for my ZX81 and I still have a liking for slicing string arrays for data! Be sure to double check these arrays are correctly entered — the smallest error will produce wrong results. Use the sample screen display to check your results.

In the graphic displays a "•" symbolises the Sun and "*h*" for Hermes (the alternative classical Greek name for Mercury to avoid confusion with "*m*" for Mars). The 'ecliptic longitude' (ecl long) gives the planet's angular distance from the First Point of Aries ie 0° measured eastwards from 0° to 360° and the 'solar elongation' (elong) the angular distance from the Sun ie 0° — a minus (—) figure indicates the planet is to the right of the Sun.

Lines 420 and 440 separate the planets into two groups — those nearer to the Sun (inner planets) and those further from the Sun (outer planets) from the chosen view point and computes their positions accordingly. Under test it will be noted that as seen from Earth, the 'inner planets' Mercury and Venus never stray far from the Sun, whilst all the remaining and therefore 'outer planets' can be found anywhere along the ecliptic. Conversely, from Neptune all the planets become 'inner planets' with Mercury to Mars sometimes never more than a fraction of a degree from the Sun — virtually undetectable to a Neptunian! ■

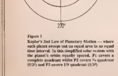


Figure 1
Kepler's 2nd Law of Planetary Motion — where each planet sweeps out an equal area in an equal time interval. In this simplified solar system with the planet's orbits equally spaced, P1 covers a complete quadrant whilst P2 covers ¼ quadrant (1/2²) and P3 covers 1/9 quadrant (1/3²)

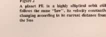
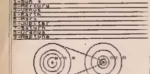
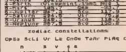
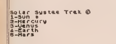


Figure 2
A planet PE in a highly elliptical orbit still follows the same "law", its velocity constantly changing according to its current distance from the Sun



Planet	ecl.long	const	elong
1-Sun *	129.3	Cnc	0
2-Mercury	145.1	Cnc	15.8
3-Venus	162.5	Leo	33.1
4-Earth	(Viewpoint)1983 Aug 1		
5-Mars	105.7	Gem	-23.7
6-Jupiter	247.3	Sco	117.9
7-Saturn	204.5	Vir	75.2
8-Uranus	248.3	Sco	118.9
9-Neptune	267.5	Sco	138.2





Planet	ecl.long	const	elong
1-Sun *	97.6	Gem	0
2-Mercury	101.9	Gem	4.3
3-Venus	89.7	Tau	-8
4-Earth	108.5	Gem	10.9
5-Mars	112.6	Gem	15
6-Jupiter	(Viewpoint)1984 Apr 21		
7-Saturn	213.4	Lib	115.8
8-Uranus	244.1	Sco	146.5
9-Neptune	270	Sgr	172.4

zodiac constellations

a ScLi Vr Le CnGe TaAr PiAq CpSa

n s   mev

u   eh

a ScLi Vr Le CnGe TaAr PiAq CpSa



Planet	ecl.long	const	elong
1-Sun *	127.1	Cnc	0
2-Mercury	(Viewpoint)1984 Oct 9		
3-Venus	146.1	Cnc	19
4-Earth	83.1	Tau	-44
5-Mars	116.3	Gem	-10.8
6-Jupiter	205.7	Vir	78.6
7-Saturn	335.2	Aqr	-151.9
8-Uranus	35.7	Ari	-91.4
9-Neptune	161.1	Leo	34

zodiac constellations

CpSa ScLi Vr Le CnGe TaAr PiAq C

nv *m   s

j   e u

CpSa ScLi Vr Le CnGe TaAr PiAq C

Solar System Trek ©
1-Sun *
2-Mercury
3-Venus
4-Earth
5-Mars
6-Jupiter
7-Saturn
8-Uranus



Planet	ecl.long	const	elong
1-Sun *	(Viewpoint)1983 Jun 26		
2-Mercury	42.1	Ari	42.1
3-Venus	235.7	Lib	-124.3
4-Earth	273.9	Sgr	-86.1
5-Mars	73.5	Tau	73.5
6-Jupiter	252.7	Sco	-107.3
7-Saturn	207.9	Vir	-152.1
8-Uranus	242.1	Sco	-117.9
9-Neptune	268.4	Sco	-91.6

zodiac constellations

r Le CnGe TaAr PiAq CpSa ScLi Vr

m   n v s

Continued over the page

```
10 REM  Solar System Trek ©
        Maurice Gavin, FRAS
20 BRIGHT 1: GO SUB 1000
30 REM ■initial screen display
40 LET L=1: CLS : BORDER RND*3
50 PRINT PAPER 5,"Solar System Trek ©"
60 PRINT AT 14,10,"ave m J su n",AT 15,9,"*",AT 15,21,"*"
70 PRINT AT 19,0, PAPER 4," rock planets ", PAPER 5," giant gas planets"
80 LET a=0: LET ax=23
90 FOR n=1 TO 9: IF n=5 THEN PAUSE 50: GO SUB 800: PAUSE 50: LET a=96: LET ax=20/17
100 CIRCLE 75+a,51,a(n)*ax
110 PRINT AT n,0, PAPER 6-(2 AND n>1)+(1 AND n>5),y$(n): NEXT n
120 GO SUB 790
130 REM ■ select viewpoint
140 INPUT "Enter planet no",k: IF k<1 OR k>9 THEN GO TO 140
150 BORDER k/2: LET j=k
160 PRINT PAPER 1,AT 10,0,b$
170 PRINT AT 11,0, PAPER 0, INK 7,"      zodiac constellations  "
180 PLOT 0,40: DRAW INK 4,255,0
190 REM ■ enter date
200 INPUT "Date (yyyy,mm,dd)",TAB 6,y,TAB 11,m,TAB 14,d: IF y<100 THEN LET y=y+1900: IF m>12 OR d>31 THEN GO TO 200
210 LET k$=o$(m*3-2 TO m*3)
220 PRINT AT j,0, FLASH 1,"<Viewpoint>", FLASH 0, PAPER 5-(2 AND k>1)+(1 AND k>5), INK 9,y," "+k$+" ",d," "+(" " AND d<10)
230 PRINT PAPER 5,AT 0,0," Planet   ecl.long const  elong "
240 REM ■ leap years/epoch days
250 LET y4=y/4
260 IF y4=INT y4 THEN LET L=0
270 IF m>2 THEN GO TO 300
280 LET b=(m-1)*(63-L)/2
290 GO TO 310
300 LET b=(m+1)*30.6-62-L
310 LET dy=INT (b+d)
320 LET ed=INT ((y-ep)*u+dy+.5)
330 REM ■ mainloop
340 FOR n=1 TO 9: IF n=9 AND n= THEN GO TO 710
350 IF n=j THEN NEXT n
360 LET pp=c*(ed/t(j))+l(j)
370 LET qe=(pp/e-INT (pp/e))*e
380 LET p=c*(ed/t(n))+l(n)
390 LET q=(p/e-INT (p/e))*e
400 IF j=1 THEN GO TO 460
410 REM ■ calc inner planets
420 IF a(n)<a(j) THEN LET el=180+qe+r*ATN ((a(n)*SIN ((qe-q)/r))/(a(j)-a(n)*COS ((qe-q)/r)))
430 REM ■ calc outer planets
440 IF a(n)>a(j) THEN LET el=q+r*ATN (SIN ((q-qe)/r))/(a(n)-COS ((q-qe)/r))
450 GO TO 470
460 LET el=q
470 IF el<=0 THEN LET el=el+e
480 IF el >e THEN LET el=el-e
490 IF el>e OR el<=0 THEN GO TO 470
500 LET el=INT (.5+el*10)/10
510 REM ■ solar elongation
520 IF n=1 THEN LET sun=el
530 IF j=1 THEN LET sun=0
540 LET b=INT ((el-sun)*10)/10
550 IF b >180 THEN LET b=b-e
560 IF b<-180 THEN LET b=b+e
570 IF el>=e THEN LET el=el-e
580 LET v=1+INT (el/30)
590 PRINT AT n,0,y$(n),
600 PRINT TAB 10,(" " AND el<0),(" " AND el<99),el,TAB 18,c$(v*4-3 TO v*4),
610 PRINT TAB 24,(" " AND b>-100),(" " AND b>=0 AND b<10),(" " AND b>=10 AND b<100),b
620 REM ■ print zodiac/planets
630 LET w=30-sun/12: IF w>=0 THEN LET w=w+1
640 LET r$=m$(w TO )+m$( TO w)
650 PRINT INK 7, PAPER 2,AT 13,0,r$,AT 20,0,r$
660 LET z=0: LET nn=n/2
670 IF nn=INT nn THEN LET z=3
680 PRINT INK 7, PAPER 1,AT 15+z,b/12-16,z$(n)
690 REM ■ plot planets position
700 CIRCLE INK 7, INT (132-b/1.5),40,1: BEEP .1,n*3: NEXT n
710 REM ■ end of mainloop
720 IF j=1 THEN PLOT 130,38: DRAW INK 6,4,4: GO TO 740
730 PLOT 132,38: DRAW INK 6,0.15
740 GO SUB 790
750 PRINT #0, Press z to copy, c to continue: PAUSE 0
760 IF INKEY$="z" THEN COPY
770 GO TO 40: REM ■ reRUN
780 REM ■ gosub "lines"
790 FOR n=175 TO 90 STEP -8: PLOT 0,n: DRAW 255,0: NEXT n: RETURN
800 CIRCLE 171,51,2: PLOT 171,53: DRAW -90,33: PLOT 171,49: DRAW -90,-33: RETURN
1000 REM ■ data & variables
1010 DIM a(9): DIM l(9): DIM t(9): DIM y$(9,9): DIM b$(32*10)
1020 LET u=365.2654
1030 LET ep=1975: LET e=360
1040 LET r=180/PI: LET rr=e/PI
1050 LET c=e/u
1060 LET F=1e3: LET G=1e4
1070 LET o$="JanFebMarAprMayJunJulAugSepOctNovDec"
1080 LET z$="*hvemjsun ■planets"
1090 LET m$=" Le CnGe TaAr PiAq CpSa ScLi Vr": REM ■zodiac signs
1100 LET l$="000000320653310975099534249529355214104173205783249915": REM ■Long at epoch(1975,0)
1110 LET t$=".00001.24085.615211.00001.880911.86229.45684.012164.79": REM ■period in years■
1120 LET a$="000001003871007233010000152370520250953601916153000079": REM ■orbit radii in AU■
1130 LET p$="1-Sun *  2-Mercury3-Venus  4-Earth  5-Mars   6-Jupiter7-Saturn 8-Uranus 9-Neptune"
1140 LET c$="Psc Ari Tau Gem Cnc Leo Vir Lib Sco Sgr Cap Aqr "
1150 FOR n=1 TO 9: LET x=n*6
1160 LET a(n)=VAL a$(x-5 TO x)/G
1170 LET l(n)=VAL l$(x-5 TO x)/F
1180 LET t(n)=VAL t$(x-5 TO x)
1190 LET y$(n)=p$(n*9-8 TO n*9)
1200 NEXT n: RETURN
1210 REM ■ data subroutine ends
9999 SAVE "SStrek" LINE 1
```

Listed searching

Bryan Skinner looks at some of the advantages of the binary chop search routine

In a previous article (*PCW* 23-29 June), I described how a string array could be searched for the occurrence of a user defined sub string The search routine described was sequential

Each specified field or column of each row was tested in turn ie the array was searched row by row If there are a large number of rows this can turn out to be a very slow procedure particularly if you are searching a random-access file on disc (which can be thought of as a large array)

There is of course a more efficient and therefore faster search algorithm that can be used The method is known by various names my favourite being the binary chop The method is without doubt the fastest way of searching a list but it does have a number of prerequisites which can be limiting

(a) The list must be in order either alphabetical numeric or ASCII (depending on the comparison mode)
(b) There must be no blank entries, ie the list must be dense
(c) The size of the list must be known
(d) Each entry must be unique as the search will only find one item
(e) Only direct matching is allowed you cannot use INSTR

The algorithm is so efficient that doubling the length of the list only adds a few extra comparisons to its operation

The procedure employed is similar to that used by human beings searching for a word in a dictionary If you were looking for the word *Search* you might open the book at its mid-point and see the word *Middle* *Search* comes after this in alphabetical order so you can ignore the first half of the dictionary

Next, you would halve the remaining pages ie open the book mid-way between the mid-point and the end You might alight upon the word *Test* which is alphabetically greater than the target word *Search* so you would halve the distance between *Middle* and *Test* perhaps finding *Perch* As this word is too "low" in alphabetical order you would halve the difference between it and the previous word *Test*, and so on

The basic operations then are

(a) Setting two points
(b) Finding the mid-point between them
(c) Testing the item at the mid-point
(d) Deciding the direction in which to proceed (if a match is not found)

Figure 1 shows the search routine in diagramatic form where we are looking for the letter *F* in the letters *A* *T*

Obviously we must also add checks to ensure that we do not "run off" either end of the list and to allow us to exit from the routine if the word is not found

The coding is relatively simple the example given sets up a list of names in a string array and allows you to search for a name You should be able to modify the actual search routine to your own needs for multi-dimensional arrays of characters or numbers but do not forget to alter the relevant variables!

Cr and *Pr* are the list pointers to the Current and Previous Records I is the mid-point between *Pr* and *Cr* Line 1090 decides the direction to search in, according to a comparison between the item being searched for and the current item being tested

Ef is used as an Error Flag to prevent oscillations between adjacent entries *Ef* is incremented each time the difference between the Current item and the Previous item equals 1 (line 1040) Line 1030 tests for running off the ends of the list ■

Fig 1

1 5 20
A B C D E F Q R S T
E
H
G

half contains target (A-J)
mid-point (letter E)
E too low so E becomes new start point
Range is new E J
Mid-point is H
H too high so H becomes new end point
Range new E H
Middle is G
G too high becomes end
Range E G
Middle is F
F is the required item

```
 0 REM SET UP AR
20 NR = 10
 0 DIM AR$(NR)
40 FOR I = 1 TO NR
50 READ AR$(I)
   NEXT
70 DATA BILL,CHARLES,ETHEL,
 0 DATA HILARY,JOHN,KEVIN,L
 0 CLS:REM %%%%%%%%%% ENTRY PO
100 PRINT "ENTER NAME TO FIND "
110 INPUT A$
120 IF A$ = "ZZZ" THEN END
130 GOSUB 1000
140 GOTO 90
150 REM %%%%%%%% END OF "MAIN PRO

1000 REM SEARCH - BINARY CHOP
1010 CR = INT((NR/2)+.5)
1020 PR = 1 : EF= 0
1030 IF CR   0 OR CR > NR THEN GOTO 2010
1040 IF ABS (PR-CR) = 1 THEN EF= EF+1:PR=PR-1
1050 IF EF > 2 THEN GOTO 2010
1060 IF A$ = AR$(CR) THEN PRINT "FOUND" :RETURN
1070 I = ABS(PR-CR)
1080 I = INT((I/2)+.5)
1090 IF A$ > AR$(CR) THEN CR = CR+I ELSE CR = CR-I
2000 GOTO 1030
2010 PRINT "NOT FOUND"
2020 RETURN
```

Assembled—part three

Jeremy Ruston continues his introduction to assembly language programming

The *And* instruction logically *Ands* the contents of a memory location with the contents of the accumulator. The *And* operation is identical to the *And* operation carried out by the Basic keyword *And*. However, the assembly language version of *And* only acts on eight bits at a time.

It can easily be extended to act upon data of arbitrary length by simply using more than one *And* instruction, each acting upon a different pair of bytes. The addressing modes allowed with the *And* instruction are the same as those used with the *Adc* instruction. The *And* instruction sets the flags as follows:

Zero flag — set if the result of the calculation was zero
Sign flag — set if the result was negative (it reflects the status of bit 7 of the result)

The *Asl* instruction works with rather fewer addressing modes than the *Adc* and *And* instructions. The addressing modes allowed are:

Accumulator eg ASL A
Zero page direct eg. ASL &20
Absolute direct eg ASL &3000
Zero paged indexed with X eg ASL &20,X
Absolute indexed with X eg ASL &3000 X

You'll notice that besides the accumulator mode, these modes can be reduced to two distinct modes — indexed with *X* and absolute — since the assembler automatically works out whether zero page should be used or not!

The *Asl* instruction mnemonic stands for 'arithmetic shift left', which means that the instruction moves all the bits in the number one position to the left. This moves the contents of bit 0 to bit 1, bit 1 to 2 and so on. But there are some slight problems. Bit zero is going to be undefined and bit 7 has nowhere to go because bit 8 doesn't exist. In fact bit zero is always left unset, and the contents of bit 7 are copied into the carry flag, in the same way as the carry flag acts as bit 8 in the *Adc* instruction.

The other status bits affected are:

Zero flag — set if the result was zero
Sign flag — set if the sign of the result was negative

The *Bcc* instruction is called a conditional jump instruction or, sometimes, a conditional branch instruction. It acts somewhat like the 'If <condition> Then Goto <line number>' statement of Basic. The *Bcc* instruction will only carry out the *Goto* to a new address if the carry flag is clear.

The way it carries out the branch is not totally expected. Rather than loading the program counter with a new value, it adds a displacement to the present value of the program counter.

There are two problems with this approach. The program counter is set to the address after the *Bcc* instruction, before the displacement is added to it, and the displacement can only be an eight bit number. This means that the range of the branch is only within +/− 125 bytes of the *Bcc* instruction. Luckily, you don't have to explicitly work out whether a branch instruction such as *Bcc* will reach a specific address, since it will not assemble an instruction which branches out of range.

To use the *Bcc* instruction in your programs, you must follow it with a label. This sample program explains what a label does:

```
.START
LDA &80
CMP &81
BCC START
RTS
```

A label is like a place marker in the program. It is created by writing the name of the label preceded by a full stop (a label can be followed by other instructions without using a colon to start a new statement). When a label is processed by the assembler, it assigns the address of the instruction that follows the label to the variable name given as the label. Thus, labels must adhere to the normal BBC Basic rules for naming variables and the label becomes a mnemonic for the address it is placed at.

When a branch or jump instruction is written, the label following the instruction is taken as the destination for the jump. It may not seem very useful to be able to execute a jump if the carry flag is set, but it allows us to do several vital things, like see which of two numbers is the larger. After we have looked at all the instructions, you will find a table of how and why each of the branch instructions should be used.

The *Bcs* and *Beq* instructions do more or less the same thing as the *Bcc* instruction, except that different conditions spark off the jump. The *Bcs* will only branch if the carry flag is set, whilst the *Beq* instruction will only jump if the zero flag is set — in other words, if the last result was zero.

The *Bit* instruction logically *Ands* the contents of the accumulator with the contents of a selected memory location and then sets the condition flags accordingly. Weirdly, it doesn't alter the contents of the accumulator or the contents of the memory byte. Thus the only effect this instruction has is on the condition flags. The addressing modes allowed are:

Absolute eg BIT &1234
Zero page eg BIT &23

In other words, you can only carry out the *Bit* instruction on the contents of a memory location the address of which is known at the time you write the program.

The point of this instruction is to allow you to see if a certain bit (or bits) of a memory location are set (or unset), without upsetting the contents of the location, and ignoring any untested bits. This is a useful operation since it allows you to set up, in effect, your own flags register in memory.

To use the instruction, first select the bits you wish to test of the location. For example, if you wished to see how bit 4 of location *&234* was set, the bit in question would be bit 4. Then, turn the value of the bit into a number. The value of bit 4 is 2^4, or 16. You can then write instructions to load this number into the accumulator and do a *Bit* instruction with reference to location *&234*. If the selected bit was zero, the zero flag will be set, otherwise it will be unset. The code needed in this example would be:

```
LDA £16
BIT &234
```

The other use of this instruction is to inspect the contents of bits 6 and 7 of a memory location, without disturbing the accumulator. For example, after this instruction the sign and overflow flags are set to the state of bits 7 and 6 respectively of location *&234*. Once these bits have been moved into the flags, you can use them in calculations. The other result is that they allow you to use the top two bits of any location as flags, and then test them without having them do anything to the accumulator — without even having to load a 'mask' as we did above.

To sum up the action of the flags:

Zero flag — set if the result of the AND operation was zero
Sign flag — set to the status of bit 7 of the memory byte selected
Overflow flag — set to the status of bit 6 of the memory byte selected

The *Bmi*, *Bpl* and *Bne* branch instructions all act like the *Bcc* instruction except they branch under different conditions. The *Bmi* instruction (Branch if MInus) will only branch if the sign bit is set, the *Bpl* instruction (Branch if PLus) will only branch if the sign bit is unset, and the *Bne* instruction will only branch if the zero flag is not set.

The *Brk* instruction is described in the User Guide in its capacity for trapping errors in programs such as the 'No such line' message in Basic. The internal action of the *Brk* instruction is to set the break flag, push the program counter and status register on to the stack and finally to jump to the routine whose address is contained in locations *&FFFE* (*lsb*) and *&FFFF* (*msb*).

It is worth pointing out that interrupts also jump to the same address. The only way the operating system can see which type of interrupt (*Brk* or external) caused the jump to the routine is to look at the contents of the flag register. Finally, the action of jumping to the routine automatically disables interrupts. ■

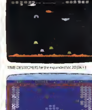
To be continued next week

This is an extract from *The BBC Micro Compendium* available from 1 August from Interface Publications, 44-46 Earls Court Road, London W8 6EJ

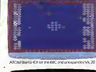

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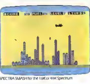
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A built-in program

Every computer program, regardless of the language in which it is written, begins its life as a series of instructions stored in a coded form within the computer's memory in the case of most languages the instructions which make up the program are quite meaningless to the central processing unit or CPU, the computer within-a-computer which will eventually be called on to execute the tasks dictated by the program To overcome this problem standing in between the program entered by the user and the CPU will be yet another program most often built into the machine at the time of its manufacture which takes the user's program and translates it into a form which the CPU is able to understand

The permanent "built-in" program, however performs another function for without its help it would be impossible for the user to enter instructions in the first place From the moment the computer is switched on the built-in program begins its task of scanning the keyboard to detect an input from the outside world It then takes those inputs and stores them in the memory in such a way that they can later be interpreted for the CPU

The user who writes programs in Basic will seldom be aware of this process Program lines will be entered, the return key pressed and the line will become part of the program — provided that the correct grammar of Basic has been observed No real effort or thought is required to insert a new instruction into the program, for the computer's memory is automatically rearranged to make space for the new input

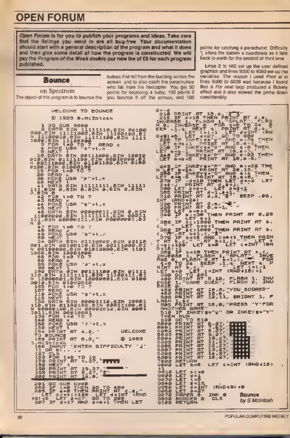
When we turn to programming in machine code the situation is not quite as simple There are no facilities built into the computer to allow a new instruction to be simply entered from the keyboard in the confidence that it will automatically be entered into the computer's memory and the present contents rearranged to make room for it The first task of a machine code programmer is therefore, to devise a method of entering instructions, examining memory and rearranging it to suit the developing needs of the program that is being entered This is true whether the machine code instructions are being entered directly in the form of numbers (which is the eventual form in which they must be presented to the CPU) or by means of a special language called assembly language, which makes machine code programs easier to enter and understand

The simplest tool which allows the necessary management of the memory to take place is called a monitor In this series we shall build up a flexible monitor program which will allow you to examine individual bytes of memory or chunks and to modify their contents at will ■

This is an extract from Commodore 64 Machine Code Master by David Lawrence and Mark England published by Sunshine Books

MASTERCODE: TABLE VARIABLES

AD	[illegible] ess in memory
AM	[illegible] memory) flag used in assembler
BASE	[illegible] er base for conversions
CO	[illegible] Monitor/COmmand in file editor
DEV	[illegible] vice for load/save
E$	Used in file editor to record empty lines
EA	(End Address) used in monitor
EC	(Error Count) during assembly
EN	(Error Number) used to indicate type of error during assembly
EO	(Error Only listing) flag used in assembler
EAM	Used to flag error conditions
EAN$	Error messages for assembler
EXIT	Set if END directive encountered by assembler
FALSE	Logical value (=0)
F1$	Main file array in file editor
FL	Line to finish list or delete in file editor
FM	Number of lines in F1$
FNDEC	Converts decimal digit to hex ASCII
FNHEX	Converts hex digit to decimal
FP	(Finish Pointer) used by list and delete in file editor
H	Used in conversion routines - H$ converted to decimal
H$	General string for input and output of hex numbers
IN$	General variable used for input
LN	(Line Number) used in file editor
PTR	Pointer used in scanning assembly language instruction
PTR$	Holds order of items in F1$
OP	Operand type: assembler and disassembler
O$	General output string
O1$	Output string used in dump of memory contents to screen
O2$	Output string used in dump of memory contents to screen and disassembler
O3$	Output string used in dump of memory contents to screen
PASS	Current pass of two pass assembler
PO	Pointer to mnemonic type
Q	Loop variable used in assembler
Q1	Start address of line being assembled
Q%	Loop variable used in assembler
Q1$	Temporary variable used in formatting assembler output
RESULT	Output of expression evaluator
SA	(Start Address) used by several routines
SE	Current number of symbols during assembly
SL	(Start Line) used in list and delete in file editor
SM	Maximum number of symbols in the symbol table
SP	Start pointer for list and delete in file editor
ST	System variable in Basic
ST$	(Symbol Table) used in assembler
SY	Used to indicate dump of symboltable in assembler
T,TA,TB,T0,T1,T2 etc	Temporary variable used in several modules
T$	Temporary variable used in several modules
TA$	Decoder tables for assembler/disassembler
T1$	Temporary variable used in several modules
TERM	Temporary result in expression evaluator
TRUE	Logical value = 1
X1	Loop variable used in Hex Loader
XY	Loop variable used in file editor
XZ	Loop variable used in file editor



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Bounce

on Spectrum

The object of this program is to bounce the babies that fall from the building across the screen and to also catch the parachutists who fall from the helicopter. You get 50 points for bouncing a baby, 100 points if you bounce it off the screen, and 100 points for catching a parachutist. Difficulty 'j' alters the babies x coordinate as it falls back to earth for the second or third time.

Lines 2 to 160 set up the user defined graphics and lines 9000 to 9080 set up the variables. The reason I used *Print at* in lines 6000 to 6009 was because I found that a *For next* loop produced a flickery effect and it also slowed the game down considerably.

```
WELCOME TO BOUNCE
© 1983 8.McIntosh

   1 GO SUB 9000
   2 DATA BIN 11111110,BIN 00100000,BIN 11111000,BIN 11100100,BIN 11100010,BIN 11111100,BIN 11111000,BIN 11100000
   3 FOR t=0 TO 7: READ x
   4 POKE USR "a"+t,x
   5 NEXT t
  10 DATA BIN 00111000,BIN 10010010,BIN 01111100,BIN 00010000,BIN 00111000,BIN 01101100,BIN 01000100,BIN 01000100
  15 FOR t=0 TO 7
  20 READ x
  30 POKE USR "p"+t,x
  40 NEXT t
  41 DATA BIN 11111111,BIN 11111111,BIN 0,BIN 0,BIN 0,BIN 0,BIN 0,BIN 0
  42 FOR t=0 TO 7
  43 READ x
  44 POKE USR "e"+t,x
  45 NEXT t
  46 DATA BIN 00000011,BIN 0,BIN 11000000,BIN 11111111,BIN 00011111,BIN 00000111,BIN 00000001,BIN 0
  47 FOR t=0 TO 7
  48 READ x
  49 POKE USR "b"+t,x
  50 NEXT t
  54 DATA BIN 01110000,BIN 00110001,BIN 00100110,BIN 00111000,BIN 00100000,BIN 01010000,BIN 11011000,BIN 10001000
  65 FOR t=0 TO 7
  80 READ x
  85 POKE USR "d"+t,x
  90 NEXT t
 100 DATA BIN 00111100,BIN 01111110,BIN 11111111,BIN 11100111,BIN 10000001,BIN 10000001,BIN 01000010,BIN 01000010
 105 FOR t=0 TO 7
 107 READ x
 110 POKE USR "g"+t,x
 115 NEXT t
 130 DATA BIN 00001110,BIN 10001110,BIN 01100100,BIN 00011100,BIN 00000100,BIN 00001010,BIN 00011011,BIN 00010001
 135 FOR t=0 TO 7
 140 READ x
 150 POKE USR "f"+t,x
 160 NEXT t
 164 PRINT AT 4,0,"      WELCOME TO BOUNCE"
 165 PRINT AT 6,0,"      © 1983 S.McIntosh"
 166 INPUT "ENTER DIFFICULTY 'J' (1 OR 0).. ";j
 167 CLS
 169 FOR t=6 TO 19
 170 PRINT AT t,27,""
 180 NEXT t
 190 PRINT AT 19,27,""
 195 PRINT AT 5,27,""
 200 PRINT AT 19,0,""
 201 GO SUB 6000
 203 IF l=0 THEN GO TO 400
 205 IF a=0 THEN PRINT AT d,a," ": LET sc=sc+100: LET d=INT (RND*9)+6: LET a=27: GO TO 200
 207 IF d=17 AND a=m+1 THEN LET d=-d
 210 PRINT AT 18,m,""
 215 IF d=18 THEN PRINT AT d,a; INVERSE 1; FLASH 1;"SPLAT"; FLASH 0; INVERSE 0: FOR q=0 TO 24: BEEP .1,q: NEXT q: PRINT AT d,a,"     ": LET l=l-1: LET d=INT (RND*9)+6: LET a=27: GO TO 200
 220 IF INKEY$="p" AND m<24 THEN LET m=m+1: PRINT AT 18,m-1," "
 230 IF INKEY$="o" AND m>0 THEN LET m=m-1: PRINT AT 18,m+3," "
 240 IF INKEY$="P" AND m<22 THEN LET m=m+5: PRINT AT 18,m-5,"     "
 245 IF INKEY$="P" AND m>=22 THEN LET m=24: PRINT AT 20,18,"     "
 250 IF INKEY$="O" AND m>4 THEN LET m=m-5: PRINT AT 18,m+5,"     "
 270 IF -d=10 THEN LET d=-d: LET a=a-j: PRINT AT d,a+j," "
 300 LET a=a-1: LET d=d+1
 305 PRINT AT d-1,a+1," "
 310 PRINT AT d,a,"": BEEP .05,INT (RND*24)
 320 PRINT AT 0,w,""
 325 PRINT AT 0,w-1," "
 330 LET w=w+1
 340 IF w>=30 THEN PRINT AT 0,29," ": LET w=1
 350 IF sc>1000 THEN PRINT AT b,c," ": LET b=b+1
 350 IF sc>1000 THEN PRINT AT b,c,"",AT b+1,c,""
 370 IF b=18 AND c=m+1 THEN PRINT AT b,c," ",AT b+1,c," ": LET sc=sc+100: LET b=0: LET c=INT (RND*18)+1
 380 IF b=18 THEN PRINT AT b,c; INVERSE 1; FLASH 1;"SPLAT"; INVERSE 0; FLASH 0;AT b+1,c,"": FOR q=0 TO 24: BEEP .1,q: NEXT q: PRINT AT b,c,"     ": LET l=l-1: LET b=0: LET c=INT (RND*18)+1
 390 GO TO 201
 400 PRINT AT 5,10; FLASH 1; INVERSE 1;"GAME OVER"; FLASH 0; INVERSE 0
 450 PRINT AT 10,8,"YOU SCORED"
 460 PRINT AT 18,m,"   "
 500 PRINT AT 12,11; BRIGHT 1; FLASH 1;sc
 505 PRINT AT 16,0,"PRESS 'Y' FOR ANOTHER GAME"
 510 IF INKEY$="y" OR INKEY$="Y" THEN RUN
 520 GO TO 510
6000 PRINT AT 6,27,""
6001 PRINT AT 7,27,""
6002 PRINT AT 8,27,""
6003 PRINT AT 9,27,""
6004 PRINT AT 10,27,""
6005 PRINT AT 11,27,""
6006 PRINT AT 12,27,""
6007 PRINT AT 13,27,""
6008 PRINT AT 14,27,""
6009 PRINT AT 18,27,""
7000 RETURN
9000 LET b=0: LET c=INT (RND*18)+1
9010 LET sc=0
9020 LET w=1
9030 LET l=5
9040 LET m=15
9050 LET d=INT (RND*9)+8
9060 LET a=27
9070 PAPER 6: INK 0
9080 BORDER 6: CLS
9100 RETURN
```

Bounce
by S McIntosh

Decimal Hax

on ZX81

This program converts decimal codes to Hex and vice versa. Although there are much simpler ways of achieving this I have deliberately made it very user friendly so that it is clear how it all works.

Parts of this program can be isolated and used seperately as toolkit routines.

Program notes

Lines	
240 300	These lines check if N L has accidentally been pressed (the commonest error when entering machine code)
500	Set the limits of Q and Z and Dim D to the maximum no of entries you wish to make at the same time
310 330 530	
530 620 1240 1210 2120 2140 2610	These lines peek to see if the screen is about to overflow. A simple check which avoids the need to use *Cont* when the screen fills up

I have used *Run* in several places to restart the program — this is because the variables need to be reset before running.

```
   1 REM  DONALD MACLEOD, MAR/83
   5 FAST
  10 CLS
  20 PRINT TAB 4;"[illegible]"
  30 PRINT ,,,,TAB 6,"**SELECT Y
OUR CHOICE**"
  40 PRINT ,,TAB 5,"**BY PRESSIN
G A  KEY**"
  50 PRINT ,,TAB 5,"**IN THE RAN
GE 1 - 4**"
  60 PRINT ,,"[illegible] ... HEX TO DEC
, ONE 1 BYTE"
  70 PRINT TAB 8,"ENTRY PER RUN"
  80 PRINT ,,"[illegible] ... AS OPTION
1 BUT WITH"
  90 PRINT TAB 6,"SEVERAL ENTRIE
S PER RUN"
 100 PRINT ,,"[illegible] ... DEC TO HEX
, ONE 1 BYTE"
 110 PRINT TAB 8,"ENTRY PER RUN"
 120 PRINT ,,"[illegible] ... AS OPTION
THREE BUT WITH"
 130 PRINT TAB 6,"SEVERAL ENTRIE
S PER RUN"
 140 PRINT AT 21,4;"[illegible]"
 150 SLOW
 160 IF INKEY$="" THEN GOTO 140
 170 LET I=VAL INKEY$
 180 GOTO 100+I*100
 200 CLS
 210 PRINT "[illegible]"
 220 PRINT AT 18,6,"ENTER 1 BYTE
HEX NOW"
 230 INPUT A$
 240 IF CODE A$=0 THEN GOTO 230
 250 FAST
 260 CLS
 270 LET H=16*CODE (A$)+CODE (A$
(2))-476
 280 GOTO 2000
 300 CLS
 310 DIM D$(8,2)
 320 PRINT "[illegible]"
 330 FOR Q=1 TO 8
 340 PRINT AT 18,6,"ENTER 1 BYTE
HEX NOW"
 350 INPUT D$(Q)
 360 IF CODE D$(Q)=0 THEN GOTO 3
50
 365 PRINT AT 18,6,"------------
--------"
 370 NEXT Q
 375 FAST
 380 GOSUB 1200
 390 GOTO 2100
 400 CLS
 410 PRINT "[illegible]"
 420 PRINT AT 18,6,"ENTER 1 BYTE
DEC NOW"
 430 INPUT X
 440 FAST
 450 CLS
 460 GOSUB 1000
 470 GOTO 2200
 500 CLS
 510 PRINT "[illegible]"
 520 DIM D$(8,4)
 530 FOR Q=1 TO 8
 540 PRINT AT 18,6,"ENTER 1 BYTE
DEC NOW"
 550 INPUT D$(Q)
 560 IF CODE D$(Q)=0 THEN GOTO 5
50
 570 PRINT AT 18,6,"------------
--------"
 580 NEXT Q
 590 FAST
 600 CLS
 610 PRINT TAB 6,"[illegible]",TAB 13;"[illegible]"
 620 FOR Z=1 TO 8
 630 LET F=0
 640 FOR K=1 TO 4
 650 IF F=1 THEN GOTO 700
 660 IF D$(Z,K)=" " THEN LET X=V
AL D$(Z, TO K-1)
 670 IF D$(Z,K)=" " THEN GOSUB 1
000
 680 IF F=1 THEN GOSUB 2600
 690 NEXT K
 700 NEXT Z
 710 GOSUB 2600
 720 RUN
1000 LET Y=X/16
1010 LET X1=INT Y
1020 LET X2=Y-INT Y
1030 LET P1=X1
1040 LET P2=X2*16
1050 LET N=28
1060 LET T=0
1070 LET R$=CHR$ (N+T) AND P2=T
1080 IF P2=T THEN GOTO 1110
1090 LET T=T+1
1100 GOTO 1070
1110 LET N=28
1120 LET T=0
1130 LET P$=CHR$ (N+T) AND P1=T
1140 IF P1=T THEN GOTO 1170
1150 LET T=T+1
1160 GOTO 1130
1170 LET H$=P$+R$
1180 LET F=1
1190 RETURN
1200 DIM H$(8,3)
1210 FOR Q=1 TO 8
1220 LET H$(Q)=STR$ (16*CODE (D$
(Q))+CODE (D$(Q,2))-476)
1230 NEXT Q
1240 RETURN
2000 PRINT TAB 6,"[illegible]",TAB 13,"[illegible]",,TAB 6,H,TAB 13,A$
2010 GOSUB 2500
2020 RUN
2100 CLS
2110 PRINT TAB 6,"[illegible]",TAB 13,"[illegible]"
2120 FOR Q=1 TO 8
2130 PRINT ,,TAB 6;H$(Q);TAB 13,
D$(Q)
2140 IF PEEK 16442=3 THEN GOSUB
2700
2150 NEXT Q
2160 GOSUB 2500
2170 RUN
2200 PRINT TAB 6,"[illegible]",TAB 13,"[illegible]",,TAB 6,X,TAB 13,H$
2210 GOSUB 2500
2220 RUN
2500 PRINT AT 21,4,"[illegible]"
2510 SLOW
2520 IF INKEY$="" THEN GOTO 2500
2530 IF INKEY$="N" THEN STOP
2540 IF INKEY$<>"Y" AND INKEY$<>
"N" THEN GOTO 2500
2550 FAST
2560 RETURN
2600 PRINT ,,TAB 6,X,TAB 15,H$
2610 IF PEEK 16442=5 THEN GOSUB
2700
2620 RETURN
2700 PRINT AT 21,4,"[illegible]"
2710 SLOW
2720 IF INKEY$="" THEN GOTO 2700
2730 FAST
2740 CLS
2750 PRINT TAB 6,"[illegible]",TAB 13,"[illegible]"
2760 RETURN
```

Decimal Hex
by Donald Macleod

Letter Head

on Dragon 32

This simple program will print either letter headings or envelopes. Lower case letters are obtained using Shift/0.

Although written for a Microline 80 the program can be adapted for most other printers.

```
10 'DRAGON PRINT
20 ' Copyright S.J.Halstead.1983
30 PRINT@0, ******* ADDRESS PRINTER *******
40 INPUT"INPUT NAME";F$
50 INPUT"INPUT 1ST LINE OF ADDRESS      ";A1$
60 INPUT"INPUT 2ND LINE OF ADDRESS      ";A2$
70 INPUT"INPUT 3RD LINE OF ADDRESS      ";A3$
80 INPUT"INPUT 4TH LINE OF ADDRESS      ";A4$
90 INPUT"INPUT TELEPHONE NUMBER         ";T$
100 INPUT"INPUT DATE";D$
110 Z$=" "
120 PRINT@480,"INPUT LETTER OR ENVOLOPE (E/L).
130 J$=INKEY$:IF J$="" THEN 130
140 IF J$="L" THEN 160
150 IF J$="E" THEN GOSUB 260
160 PRINT#-2,TAB(52),F$
170 PRINT#-2,TAB(52),A1$
180 PRINT#-2,TAB(52),A2$
190 PRINT#-2,TAB(52),A3$
200 PRINT#-2,TAB(52),A4$
210 PRINT#-2,TAB(52),T$
220 PRINT#-2,TAB(52),Z$
230 PRINT#-2,TAB(52),D$
240 GOTO 120
250 REM ENVOLOPE SUB ROUTINE.
260 PRINT#-2,TAB(18),F$
270 PRINT#-2,TAB(18),A1$
280 PRINT#-2,TAB(18),A2$
290 PRINT#-2,TAB(18),A3$
300 PRINT#-2,TAB(18),A4$
310 GOTO120
```

Letter Head
By S Halstead

Designer

on Oric

This program was written on a 48K Oric-1, but should work without modification on the 16K model. It is a useful aid to designing your own characters. Normal character generators will not work on the Oric, due to the unusual size of the characters. The display has a horizontal resolution of only 240 pixels (dots), but has a character width of 40 columns. The price for these extra characters per line is a character of only six pixels wide instead of the usual eight.

When the Oric is switched on or the reset button is pressed, the character set is copied into *Ram*. Thus virtually any character can be redefined in the following way

```
1 FOR A = 0 TO 7
2 READ D
3 POKE 46080 + A + (8 × n) D
4 NEXT A
5 DATA 1st row 2nd row      8th row
```

Where n is the ASCII code of the character. The *Data* statement contains eight numbers, each the decimal equivalent of a row of the new character. These numbers normally have to be worked out using graph paper and a knowledge of binary.

When the program is run, you will be asked to enter the character to be changed. It can either be entered as the symbol or the code. Codes 160-255 are free, and can be redefined at will. But if you wish to be able to print the character at will then a character from the keyboard should be used as in the program. After the screen has cleared, a grid is printed containing a flashing cursor. This can be moved at will using the arrow keys.

To fill a square, press the space bar. *'Del'* will empty it. If you make a complete mess of your character, or change your mind, 'C' will clear it. When you are satisfied with your design, press *'Return'* to store it in memory. If the 'R' key is pressed, the decimal number for each row will be displayed (this data is for the character stored in memory, and will not change until the new character is stored).

You can leave the program at any time by pressing 'E'. Pressing 'N' will cause the program to clear the screen and ask for the next character to be changed. These commands are summarised below the grid for convenience.

The program does not allow you to save the character set as it is cleared as soon as Reset is pressed. The numbers should be copied down after pressing 'R'.

```
1 FOR A=0 TO 7
2 READ D:POKE 46080+(8*ASC("[")+A),D
3 NEXT A
4 DATA 63,33,33,33,33,33,33,63
5 FOR A=0 TO 7
6 POKE 46080+(8*ASC("\")+A),255
7 NEXT A
8 DIM CH(6,8):DIM TCH(8)
9 X=1:TX=1:Y=1:TY=1
10 PAPER 0:INK 6:PRINT CHR$(20)CHR$(17)
15 CLS
20 PRINT"Character (symbol or code) ";:INPUT C$
21 IF VAL(C$)>0 AND VAL(C$)<32 THEN GOTO 20
22 IF VAL(C$)=0 THEN CHR=ASC(C$)
23 IF VAL(C$)<>0 THEN CHR=VAL(C$)
24 FOR A=1 TO 6:FOR B=1 TO 8
26 CH(A,B)=0
28 NEXT B:NEXT A
30 CLS
35 PLOT 10,0,"Character:":PLOT 20,0,2:PLOT 21,0,CHR$(CHR):PLOT 25,0,6
```



```
37 PLOT 26,0,"Code ":PLOT 31,0,STR$(CHR) PRINT
40 FOR A=1 TO 8 PRINT'EEEEEE' NEXT A PRINT PRINT
45 PRINTCHR$(130);"RETURN";CHR$(134);" to store character"
46 PRINTCHR$(130);"DEL",CHR$(134)," to empty square"
47 PRINTCHR$(130);"SPACE BAR";CHR$(134);' to fill square"
48 PRINTCHR$(130);"R";CHR$(134);" to review character data"
49 PRINTCHR$(130);"E";CHR$(134);" to stop Program"
50 PRINTCHR$(130);"N",CHR$(134);" for next character"
51 PRINTCHR$(130);"C";CHR$(134);" to clear grid"
52 PRINTCHR$(130);"ARROW KEYS";CHR$(134);" to move flashing cursor"
55 FL=1-FL PLOT TX,TY,CH(TX,TY)+91 TX=X:TY=Y
60 PLOT X,Y,91+FL
70 K$=KEY$
80 IF K$=CHR$(9) AND X<6 THEN X=X+1
90 IF K$=CHR$(8) AND X>1 THEN X=X-1
100 IF K$=CHR$(11) AND Y>1 THEN Y=Y-1
110 IF K$=CHR$(10) AND Y<8 THEN Y=Y+1
120 IF K$=CHR$(13) THEN PLOT TX,TY,(CH(TX,TY)+91):GOTO 200
130 IF K$=CHR$(127) THEN CH(TX,TY)=0
140 IF K$=CHR$(32) THEN CH(TX,TY)=1
150 IF K$=CHR$(101) THEN PRINT CHR$(20)CHR$(17):END
160 IF K$=CHR$(114) THEN GOSUB 2000
170 IF K$=CHR$(110) THEN CLS:GOTO 20
180 IF K$=CHR$(99) THEN GOTO 24
190 GOTO 55
200 FOR A=1 TO 8:TCH(A)=0 NEXT A
205 FOR A=1 TO 8
210 FOR B=1 TO 6
220 IF CH(B,A)=1 THEN TCH(A)=TCH(A)+(2^(6-B))
230 NEXT B
240 NEXT A
250 FOR A=0 TO 7
260 POKE 46080+(8*CHR)+A,TCH(A+1)
270 NEXT A
280 GOTO 55
2000 FOR A=0 TO 7
2010 PLOT 10,A+1,"   "
2020 P=PEEK(46080+(8*CHR)+A)
2030 PLOT 10,A+1,STR$(P)
2040 NEXT A
2050 RETURN
```

Designer
by Andrew Roberts

Sound Waves

on Spectrum

This program demonstrates a simple practical use for your Spectrum Using an *In* instruction the computer will display a waveform of the sound it finds there

```
   The above are sample print
outs from my sound wave program.
   Music etc. should be fed in
through either the ear or mic
sockets at the rear of your
spectrum and the program run.
It will produce a waveform like
one of the above ( taken from
'DARE' by the Human League.

   Copies of a wave can be made
using 'COPY' on a ZX-printer


  10 REM SOUND WAVES
  20 REM © S.Lathrope
  30 REM 10 4 82
  40 REM
  50 LET z=130: PLOT 0,z
  60 FOR n=0 TO 252 STEP 8
  70 LET y=(IN 65022)/2
  80 DRAW 2 ,z-y
  90 LET z=y
 100 NEXT n
 110 CLS : GO TO 50
```

Sound waves
by Steve Lathrope

Monte Carlo

on BBC

This program is like the arcade game Turbo You have to dodge the oncoming cars while travelling towards a city At the end your score and the hi-score is shown

Program notes

The scrolling is done in a text window in line 120 This means that only a section of the screen is scrolled

Difficulty can de increased by changing the *Rnd* in line 220 Sound effects can be added For example, line 215 can be inserted as follows

215 *Sound* 1 0 210 1 *Sound* 0 15 3,2

As it stands the program runs in about 2K on a BBC model B in Mode 1

```
10 REM*****************
20 REM** MONTE CARLO **
30 REM**D.RUEGG AGE12**
40 REM** MAY/JUNE83  **
50 REM*****************
60 SCORE%=0 HISCORE%=0
70 X%=640 Y%=20 LEFT%=0 RIGHT%=0
80 MODE7·VDU23;8202;0;0;0;·PROCINTRO
90 MODE1·VDU23,8202;0;0;0;·SCORE%=0 *FX11,0
100 VDU23,224,255,195,195,255,255,195,195,255
    ,255,23,226,255,24,189 255,153 0,0,0,23,
    228,255 255,255,255,255 ,255,255,255
110 PROCSCREEN
120 VDU28,17,31,22,16
130 PROCLINES
140 GCOL0,2 VDU5·MOVEX%,Y%·PRINTCHR$226
150 A$=INKEY$(8)
160 IFA$="Z" AND X%>544 THEN X%=X%-32·LEFT%=1
170 IFA$="X" AND X%<704 THEN X%=X%+32·RIGHT%=1
180 IF LEFT%=1 THEN GCOL0,0·VDU5 MOVEX%+32,Y%·
    PRINTCHR$228
190 IF RIGHT%=1 THEN GCOL0,0·VDU5 MOVEX%-32,
    Y% PRINTCHR$228
200 LEFT%=0 RIGHT%=0
210 VDU4·PRINTTAB(0,0);"";·VDU11
220 IF RND(4)=1 THEN PROCNEWCARS
230 IF POINT(X%,Y%)=3 THEN PROCCRASH:GOTO70
240 GOTO130
250 DEFPROCLINES
260 GCOL0,1 MOVE640,480·DRAW640,512
270 ENDPROC
280 DEFPROCNEWCARS
290 N=RND(6)·SCORE%=SCORE%+1
300 GCOL0 3 VDU5·MOVE512+(32*N),480·PRINTCHR$
    226
310 ENDPROC
320 DEFPROCSCREEN
330 VDU19,1,6,0,0,0,19,3,5,0,0,0,19,2,2,0,0 0
340 GCOL0,1 MOVE0,544·MOVE0,1024 PLOT85 1280
    1024 MOVE1280,544 PLOT85 0,544
350 COLOUR3
360 FORA=12TO28
370   READB
380   FORC=14TO0 STEP-1
390     PRINTTAB(B,C);CHR$224
400     NEXTC
410   NEXTA
420 RESTORE
430 GCOL0,2 MOVE0,0 MOVE0,544·PLOT85,544,544
    ·MOVE384,0 PLOT85,0,0 MOVE736,544.
    MOVE1280,544·PLOT85,1280,0·MOVE896,0·PLOT85,
    736,544
440 GCOL0,1·MOVE640,0 FORL=0TO512 STEP32·
    DRAW640,L·NEXT
450 ENDPROC
460 DEFPROCCRASH
470 FORD=15TO0 STEP-1·SOUND3,-D,20.5·NEXT
480 TIME=0 REPEAT UNTIL TIME=300
490 IF SCORE%>HISCORE% THEN HISCORE%=SCORE%
500 ENDPROC
510 DEFPROCINTRO
520 PRINTTAB(4,1);CHR$132;"SCORE= ";SCORE%;
    TAB(20,1);CHR$132;"HI_SCORE= ";HISCORE%
530 FORDOUBLE=4TO5·PRINTTAB(9,DOUBLE);CHR$1
    41;CHR$131;"MONTE CARLO"·NEXT
540 PRINTTAB(10,7);CHR$130;"by D. Ruegg"
550 PRINTTAB(4,10);CHR$129;"Dodge the
    oncoming cars to"
560 PRINTTAB(4,12);CHR$129;"score points."
570 PRINTTAB(4,15);CHR$133;"Controls-";TAB
    (8,18);CHR$134;"Z = LEFT  X = RIGHT"
580 PRINTTAB(10,21);CHR$157;CHR$132;CHR$136
    ;"PRESS BAR   ";CHR$156
590 W$=GET$ IFW$<>" " THEN 590
600 ENDPROC
610 REM**************
620 DATA12,11,11,11,10,10,10,9,10,10,9,9,10
    ,10,11,11,10
630 REM**************
```

Monte Carlo
by David Ruegg

Bomb Disposal

on VIC20

This game requires a Vic20 with a 3K expansion fitted

You are a bomb disposal expert and have to defuse six bombs which are located in a street You are in your car which has a steering fault The car circles unless a key is held down in which case the car moves off at a tangent and resumes the clockwise circular action as soon as the key is released

If you collide with anything other than a bomb you will lose one of your three lives the number of which are shown top right Also if you take too long (over a minute) the bombs will explode and you will lose another life

Before each life you have four moves in any direction to make sure that when the car starts circling it does not hit someone Once you have defused all the bombs you receive a bonus and six more bombs and more shoppers, making the game harder

During the game if you wish to stop the action press '← To restart press any key

Program notes

7 300	Setting up variables and screen
310-380	Four moves before starting routine
382 730	Main body of the program
740-850	Instructions
900 930	Cleared sheet routine
2000 3200	Hi-res graphics and letters
5000-5890	Sound and graphics display for explosion

The screen is headed by hi-res score time-left and lives below which is a bordered street with people the bombs and your car

PROGRAM OF THE WEEK

```
1 GOSUB740
5 GOTO9000
7 POKE650,255 R(1)=1 R(2)=22 R(3)=-1
  R(4)=-22
10 POKE36879,8 C(1)=131 C(2)=132 C(3)
   =133 C(4)=130
20 PRINT"" D(1)=-21 D(2)=23 D(3)=21
   D(4)=-23
30 SC=0 C=30720 SK=5 S=36075 LL=3
40 POKES+3,15 W=1
50 PRINT"
60 PRINT"                         ",
70 FORN=0TO17
80 PRINT"                         ",
90 NEXTN
100 PRINT"                        ",
```

```
110 PRINT"'——————————————",
111 POKE8105,75 POKE0105+C,5
120 FORN=0TO5
130 GOSUB2000
150 POKE7724+A,128
160 POKE38444+A,7
170 POKES (A/4)+128
180 NEXTN
190 POKES,0
200 FORN=0TOSK
202 B=6
210 GOSUB2000
230 POKE7724+A,129
240 POKE38444+A,2
250 POKES+1,(A/4)+128
260 NEXT
270 POKES+1 0
280 GOSUB2000
290 TI$="000000"
300 P=A+7724 Q=1
310 FORN=1TO4
315 POKEP,130
316 POKEP+C,1
320 GETA$
325 IFA$=""THEN320
326 POKEP,32
330 IFA$="Y"TNENP=P-22 A=P-7724
    GOSUB2010
340 IFA$="B"THENP=P+22 A=P-7724
    GOSUB2010
350 IFA$="G"THENP=P-1 A=P-7724
    GOSUB2010
360 IFA$="N"THENP=P+1 A=P-7724
    GOSUB2010
370 IFQ>1THENGOSUB2000 P=A+7724 Q=1
380 NEXTN
382 FORN=1TOLL POKE7697+N,130 NEXT
385 T=60-VAL(RIGHT$(TI$,2)) IFT=2THEN
    5000
390 PRINT"■■FGH■■",SCTAB(11),"■■IJ■
    ■■■",T
400 GETA$
401 IFA$="←"THENB$=TI$ POKE190,0 WAIT
    190,1 TI$=B$ GOTO400
402 IFB=0THEN900
403 IFA$=""THENGOSUB700 GOTO400
404 IFVAL(TI$)=100THEN5000
405 POKEP,32
410 P=P+R(W)
420 IFPEEK(P)<>32THENGOSUB450
430 POKEP,C(W) POKEP+C,1
440 GOTO305
450 IFPEEK(P)=120THENSC=SC+100*SK
    GOTO470
460 GOTO5000
470 FORN=230TO254
480 POKES+1,N
490 POKES+3,15
500 NEXT
510 B=B-1 RETURN
700 POKEP,32 W=W+1 IFW=5THENW=1
710 P=P+D(W) IFPEEK(P)<>32THENGOSUB450
720 POKEP,C(W) POKEP+C,1
721 IFTI$="000100"THENGOTO5000
722 T=60-VAL(RIGHT$(TI$,2))
723 PRINT"■■FGH■■",SCTAB(11),"■■IJ■
    ■■■" T
725 FORN=0TO100 NEXTN
730 RETURN
740 PRINT"■" POKE36879,25
742 FORN=0TO21 POKE7680+N,160 POKE
    38400+N,(NAND7) POKE8164+N,160
    POKE38884+N,(NA
ND7) NEXT
750 PRINT"■■■■■■■■■BOMB SQUAD■■■■■■■■
    ■■■■"
760 PRINT"■■Y-UP■■■■■■B-DOWN"
770 PRINT"■G-LEFT■■■■■■■H-RIGHT"
780 PRINT"■■AFTER FUUF INITIAL
    ■MOVES ANY KEY WILL
    ■SEND THE CAR OFF AT A"
790 PRINT"■TANGENT."
800 RETURN
850 FORN=0TO150 NEXTN
860 RETURN
900 SC=SC+500
910 SK=SK+1
920 FORN=254TO220STEP-1 POKES+3,15
    POKES-1,N NEXT POKES-1,0
930 GOTO40
2000 A=INT(RND(1)*462)
2010 IFPEEK(A+7724)<>32THENQ=Q+1
     GOTO2000
2020 RETURN
3000 FORN=5120TO7160 POKEN,PEEK(27648+
     N) NEXT
3010 FORN=6144TO6263
3020 READA POKEN A NEXT
3030 DATA60,60,24,60,126,126,60,24
3040 DATA24,90,126,24,24,60,36,102
3050 DATA60,60,126,66,60,126,66,60
3060 DATA0 108,183,183,183,183 108,0
3070 DATA60,66 126,60,66,126,60,60
3080 DATA0,54,237,237,237,237 54,0
3090 DATA0 238,136,136,232,40,40 238
3100 DATA0,238,170,174,172,172,170,234
3110 DATA0,224,142,128,192,142,120,224
3120 DATA0,234,75,75 74 74,74,74
3130 DATA0 184,160,162,176,162 160,184
3140 DATA255,129,129,129,129,129,129,
     255
3150 DATA0,126,66,66,66,66,126,0
3160 DATA0,0,60,36,36,60,,0
3170 DATA0,0,0,24,24,0,0 0
3180 POKE36869,253
3190 POKE51,255 POKE52,19 POKE55,255
     POKE56,19 CLR
3200 GOTO7
5000 POKES+4,25
5010 FORE=0TO200 NEXTE
5020 POKES+4,8
5030 POKES+2 220 POKES-1,128
5040 FORN=15TO0STEP-.05
5059 POKES+3,N
5060 NEXTN
5070 POKES+2,0 POKES-1,0
5071 POKEP,139 GOSUB850 POKEP 140
     GOSUB850 POKEP,141 GOSUB850
     POKEP,142 GOSUB850
5072 POKEP 32
5075 W=1
5080 LL=LL-1
5085 IFLL=0THENPRINT"■■■■■■■■■■■■■■
     ■GAME OVER" POKE198 0 WAIT198,
     1 RUN7
5090 GOTO40
```

Bomb Disposal
by Benedict MacCarty



Zodiac adventure

This week I want to look towards the Oric 1 As I said in my review of the machine in *PCW* 13 January the Oric — or any new machine — will only thrive if supported by good software And I don't mean another version of *Frogger* or *Scramble* (although a version of *Zaxxon* would be welcome!)

The Oric seems to be gradually attracting software houses and Tansoft in particular appears to be doing rather well at the moment in supplying different programs for the new computer

Following on from my look at the letter from Mr Fletcher a couple of weeks ago a few people have written to me in reply If you follow this column, you'll remember that Mr Fletcher had done quite well in the *Zodiac Adventure* for the Oric having collected five Treasures and 10 signs I thought then that it was too good to be true and W J Bailey informs me that indeed there are only six signs to find Apparently there are several red herrings If you should be in the middle of this adventure you might like to know that *The Ram* and *The Scorpion* are both bogus treasures according to Mr Bailey However he like Mr Fletcher has only found five treasures

Roger Grimshaw also writes in regard to the Oric and more particularly, the *Zodiac Adventure* As far as I know this is the only adventure for the Oric so far available so it's not surprising that I get a lot of letters on the subject! Roger has only collected five of the treasures but has some ideas on cracking the safe which is where Mr Fletcher was stuck

Jim Gibson wrote to me from Harrow about *The Zodiac* and told me of his wife Shelagh who spotted the Corn from Capri — well, Jim it doesn't mean anything to me I hope that it means something to somebody! Jim suggests that to get to the safe you need an expert He also says "How about a review of Zodiac?" Yes Jim, how about a review?

I also received a letter from G M Phillips who actually wrote the adventure for Tansoft He also offered advice for Mr Fletcher on cracking the safe The consensus of opinion seemed to lean towards asking somebody else to crack the safe for you, Mr Fletcher isn't there a jail somewhere nearby?

Roger also has a few hints to give to people stuck in *The Zodiac* who have been thrown into jail and are being asked awkward questions The best answers to give are

1 any colour but blue
2 any number but nine
3 SEOUL

And finally I must add that this program is not the A+F version

Rushing into the nearest photo booth to change computers I received a plea from S Lowe asking for help in *Faust's Folly* from Abbex This adventure is for the 16K or 48K Spectrum Mr Lowe would like to know how to get past the wheel at the beginning of the game Have you tried twisting the wheel Mr Lowe?

Faust's Folly is a text game but supported by little one-character graphics appearing beside the description of each location I haven't progressed very far with it, myself and I would welcome any advice that you can offer I hope to have a closer look at this adventure at a later date

Pausing only to sidestep an Oric, I'll change computers again and ask my colleague Brian Cadge to look at an adventure for the Dragon — *Madness and the Minotaur*

"This is one of Dragon Data's own offerings (although it was actually written by Spectral Associates) It is a machine code text only adventure The manual supplied is fully comprehensive and describes the program as a "Classic adventure game" and such it is The usual two word commands are given — 'Get Lamp' 'Look Bottle' etc as well as a number of magic spells such as Balrog which can be cast to perform various unexciting things like dispelling fog Abreviations are not allowed except for North South etc

"Typing Help only ever seems to provoke the reply Don't ask me — you got yourself into this mess — perhaps this appeals to the American sense of humour (colour is also spelt color and centre is spelt center — couldn't they have updated this for the British market?) The object of the game is, of course to collect all the treasures and kill the monsters The program is in Real Time — frequently when you have half typed a command it will interrupt to say you have been killed or are being attacked The only use of sound is the occasional warning beep

"Dragon Data claims the program is an adult adventure game Playing the game one can see why it wouldn't appeal to younger users — the lengthy descriptions and long command words are not a good feature for children There is no facility to save the game so far completed no graphics, very little sound and you cannot create your own custom character All in all, I cannot enthusiastically recommend the game to anyone *Madness and the Minotaur* is available from Dragon dealers at £7 95

In the meantime as R Miller of Newark warns me *Never take Jabber the Hutt out to dinner (his manners are awful!)* ■

This [illegible] is designed for novice and experienced Adventurers alike Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter So if you have an Adventure you want reviewed or if you are stuck in an Adventure and cannot progress any further write to Tony Bridge Adventure Corner *Popular Computing Weekly* Hobhouse Court 19 Whitcomb Street London WC2 7HF

WIN A LYNX!

This competition is designed just for young people — you must be aged under 18 on September 1 1983 in order to enter

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To enter the competition simply fill out the accompanying form and send it together with your essay to

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Rules

(1) Each entry must consist of a 1,000-word essay preferably typed double spaced on one side of the paper only together with a completed entry form
(2) All entrants must be aged under 18 on September 1 1983
(3) Closing date for competition entries is September 1 1983
(4) The judges decision is final
(5) No employees of Sunshine Publications Ltd or their families will be eligible to enter

LYNX COMPETITION

Name

Address

Age

Date of birth

Tel No





ORIC CONVERSION

David Lee of Valnav Road Tooting London writes

Q **A few years ago my father bought several computer and electronic magazines back from America. Apart from the fun of seeing how far computers have come in just a few years, there are some programs in them that I have tried to convert to my Oric.**

Generally I have not had many problems, however, two commands which are not used a lot have me baffled. They are Ne and *Sleep*. Can you help?

A *Ne* is either a short version of *New* or a form of not equal to which we know and use as the sign <>. You have to work out which one applies to the program from the context, although I would suggest that if it occurs within a program especially if part of a numerical statement, then it would be not equal to.

Sleep is like a *Pause* statement. It simply stops the program running for a certain length of time. The length, probably tenths of a second, is defined in the number that follows the command.

COMMAND COLLISION

Saad Atibas of Edward Street, Werneth, Oldham, Lancs, writes

Q **I have recently bought a BBC computer and have learned to do many things on it. But, could you tell me how to use the *Point* command to see whether two objects have hit each other on the screen? Could you give me a small program that will show how this is done? Also, is there any other command that will do the same?**

A The *Point* command returns the colour of the screen as a particular set of co-ordinates (x, y). So, you would have to set up a pair of co-ordinates and then read them to see if they returned the same value as the item that is trying to dodge them. So for example if your missiles had the colour a, and it was in the same place as an invader, colour *b* then you have hit the alien. A line *If Point (x, y) = b Then* would take you to the hit routine. A line *If Not Point (x, y) = b Then* would carry on with the program.

There is an alternative, which is to use the call *Fx 135*. This is described on page 432 of the manual, along with other *Fx* calls. This returns the character at the current cursor position. By reading this, you can work out whether or not a missile and invader are trying to occupy the same location on the screen.

SPECTRUM SCRABBLE

R Walker of Church Street, Blaenau Festiniog, Gwynedd, writes

Q **I have a 48K Spectrum and am well pleased with it. My family and I are keen *Scrabble* players, and I would like to know if there are any good *Scrabble* programs available for the 48K Spectrum. If so, how many can play, and can the computer play?**

A Psion has just brought out a *Scrabble* program in conjunction with Little Genius. It is an amazing achievement, with an 11,000 word vocabulary. It plays the full *Scrabble* rules and up to four people can play. You can use the computer to just keep score and maintain the board, or it can act as one of the players. You should be able to find it in W H Smiths.

COMMODORE PROGRAMS

Robert Willoughby of Dunsford, nr Exeter, Devon writes

Q **I have recently bought a Commodore 64. It is difficult to find magazines with programs for this computer in them. Please could you tell me if there are any magazines with programs for this computer, or are you going to print some in your magazine?**

A The Commodore 64 has taken a few months to become established on the market. However, with its new low price I am sure that it will be a success.

We have every intention of covering it in greater depth than we have up to now (see the Commodore 64 page in this issue). Remember, we carried a review of the computer before it was released, way back at the beginning of September last year.

HISTORICAL DATES

Christopher Snow of Brook Gardens, Compton Greenfield, nr Bristol writes

Q **Could you please tell me when the first computer was made?**

A Assuming that you are going to ignore such things as the abacus, the Inca quipu, and other adding, calculating aids I will quote you a line from *Myth of the Micro* by Rodney Dale and Ian Williamson. 'The early years of computers and electronics are full of such contradictory claims ...'

What I will do is simply give you a list of important dates and achievements. 1614 — Napiers Bones — is an important date, and by the end of that century, Pascal and Leibnitz had both developed mechanical calculators. By the 1800s the slide rule as we know it, had been developed. In the 1820s Charles Babbage had started on his 'Difference Engine' which many people regard as an important precursor to the electronic computer. This was further developed into the 'Analytical Engine' with the help of Lady Lovelace.

By the early 1930s, several very powerful mechanical calculators had been developed in America. These were essentially just better versions of early adding machines made possible by better use and control of metals. In 1937 Stibitz used a series of relays and light bulbs to add two binary numbers.

The final impetus came with World War Two and it seems that the British won, very much under the guidance of Alan Turing who developed the concept of the Algorithm. The machine was called Colossus and the date was 1943. Until quite recently, the Americans had claimed the start with Eniac which was finished in 1946. Colossus was only revealed after the 30-year period demanded by the official secrets act expired.

BBC MANUAL

Lee Dobson of Barnard Avenue, Coal Aston Sheffield, writes

Q **I have a BBC microcomputer, model B. I have recently upgraded the operating system from 0.1 to 1.2 Rom (though the 0.1 said Eprom on the screen). As you do not get any sort of extra manual, or leaflet with the new Rom, I am having difficulty learning some of the new commands, namely *Plot* and *Fill*. Some I have found out for myself, but could you advise me where I could get the information I want?**

A The commands are in the manual and, from what you say, I can only presume that you still have the old provisional manual. All the replacement manuals should have been sent out by now though I do not think that anyone would be too surprised if some had been 'misplaced'.

Acorn are in fact meant to be re-issuing the manual sometime, though I for one will believe it when I see it. Until then, I can only suggest you supplement what is in the manual by keeping an eye on the magazines particularly those dedicated to the BBC.

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, *PCW*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.



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CRUISING & BLIND ALLEY

Cruising

The winner of last month's competition with a score of 43552 was Carl Doran of Skidby Mill North Humberside Entries for this month's competition close on August 31

Blind Alley

The highest score sent in so far this month is 99955 from I Wilson of Thornaby Stockton Entries for this month's competition close on August 31

CARDS

If software houses don't release *Mastermind* or *Space Invaders* when they begin operating then they release versions of card and other gambling games

One such company has decided to do just that for the ZX81 — so if you fancy playing *Poker Dominoes* or *Brag* you can get any two for £2 35 on one cassette

Program *Poker/Dominoes/Brag*
Price *£2 35*
Micro *ZX81 16K*
Supplier *W Jefferson*
29 Arundel Walk
Pelton
Chester Le-Street
Co Durham

STARRED

Things to do with your Spectrum other than kill aliens number nine learn astrology

Now I know there are a lot of computer buffs who are not very keen on unscientific things like astrology they are even less keen on using computers for astrology — oh the degradation! So I apologise in advance to anyone who may feel upset when I say that Astrocalc specialises in astrology programs

Astrocalc has a number of packages for a series of micros including Spectrum and Genie

Astrotutor is a series of five cassettes which teach you all you need to know about planets signs, houses, aspects, etc and then tests you on your knowledge The price of the individual units varies, but the complete set is available for £20

Program *Astrotutor*
Price *£20*
Micro *Spectrum 48K*
Supplier *Terry Dwyer*
(Astrocalc)
53 Loughborough Road
Quorn
Loughborough LE12 8DU

IMPOSSIBLE

And All Because must be the first game ever to have been inspired by an advertisement

There are nine different screens, in each of which you have to accomplish some impossible task like motorbiking down a ravine or hang-gliding over a ledge — and all because you want to deliver some chocolates to your girlfriend

Whether this will be as powerful a motivation towards brave deeds as saving the world from aliens remains to be seen

Program *And All Because*
Price *£6 95*
Micro *Dragon 32*
Supplier *B&H Software*
208 King Street
Cottingham
Hull

A CLASSIC

If you have an 8K or 16K Vic then now you can play *Galaxians* on it What do you mean, you are already?

Some people will not have a copy of the classic arcade game, where you blast away at birds which flutter around Now there is another version to choose from

Cosmic Fire Birds from Solar Software has all the features, like 99 levels, demo version and bonuses and is written entirely in machine code

Program *Cosmic Fire Birds*
Price *£9 95*
Micro *Vic20 (@16K)*
Supplier *Solar Software*
51 Meadowcroft
Radcliffe
Manchester M26 0JP

SPECIALISED

Some of the programs I'm being sent these days for the Spectrum are pretty specialised

Planet Software's *Aerofoil Directory* is for makers of model aircraft It is intended to assist design by maintaining aerofoil data in an accessible form and by providing a facility for quickly calculating the dimensions of wing ribs

OK I'll be honest I don't understand any of that last paragraph, I stole it from the press release However, I'm sure all model aircraft fans will understand it

Program *Aerofoil Directory*
Price *£4 95*
Micro *Spectrum 16/48K*
Supplier *Planet Software*
24 Marl Road
Radcliffe-on Trent
Nottingham
NG12 2GY

IMPROVED

It may come as a shock to some people to realise that the BBC B's Basic could actually be improved — that anyway is the opinion of Vachettes Micros

Its system, which will only work on the B with the OS1 2, includes functions like *Circle* and procedures like *Popgos*, which will delete from memory the last *Gosub* return address so that you can jump out of subroutines

There are plans to increase the commands available on subsequent versions

Program *BBC Extended Basic V I*
Price *£5 50*
Micro *BBC B (OS1 2)*
Supplier *Vachettes Micros*
Marshborough
Sandwich
Kent CT13 0PG

HISTORY

The latest book from the National Computing Centre is Introducing Computers by Malcolm Peltu

The book is intended to be a comprehensive guide to the history of computers and their development It also includes sections on the various uses to which computers are put

It's a mark of something or other that this book retails for £5 50 and has 326 pages with various pictures and plates, whereas most computer books cost £5 95 for not much over 100 pages

Book *Introducing Computers*
Price *£5 50*
Micro *General*
Supplier *NCC Publications*
The National
Computing
Centre
Oxford Road
Manchester M1 7ED

PILOT

ISCA SOFTWARE
WARRIOR
FOR VIC 20

ISCA Software is a company producing games for Vic20 Its first release is *Warrior*, the scenario for which will seem strangely familiar

You must pilot your light cycle around the screen avoiding light trails and pylons If you reach a purple power point you gain 100 points If the robot warrior reaches one you lose 100 points

The game will work either with a joystick or the keyboard

Program *Warrior*
Price *£5*
Micro *Vic20*
Supplier *ISCA Software*
56 Whitchurch Ave
Exeter EX2 5NT

NEW RELEASES

STRUCTURED



The BBC educational market seems to be getting into gear with the release of a number of professional (and expensive) products

A company which seems to be specialising in this field is ASK Software, which has just released five educational packages for the BBC B

The packages are adapted from programs written originally for the Vic and are mostly written in Basic

Facemaker teaches sentence structure in the form of an Identikit picture of various mouths noses ears and hats, etc Reading the name of each feature, together with an associated description, is supposed to help powers of description

Program *Facemaker*
Price *£9 95*
Micro *BBC B*
Supplier *Applied Systems Knowledge*
London House
68 Upper
Richmond Road
London SW15 2RP

POOLED

At £200, or thereabouts, the Commodore 64 will be a very competitive machine — small wonder then that the news of the price drop has meant a significant increase in the amount of new software on offer

Bubble Bus has a version of pool for the 64 called *Hustler* — it uses machine code and sprite graphics and offers six games for either one or two players

This is the first of a range of software the company intends to supply for the 64

Program *Hustler*
Price *£5 99*
Micro *Commodore 64*
Supplier *Bubble Bus*

The Computer Room
87 High Street
Tonbridge
Kent TN1 1LS

SHUTTLE

4 Mat specialises in educational software for the BBC computer

Spacex places you in the *Golden Hind* — a space research vessel You have jaunted off in your space shuttle to visit the Kleptoes — a semi-intelligent species who collect things and hide them

Somehow all this has strong educational implications — the fact that they are not obvious may be a sign that it actually works

Program *Spacex*
Price *£10*
Micro *BBC*
Supplier *4 Mat Educational Software*
Linden Lea
Rock Park
Barnstaple
Devon EX32 9AQ

LANGUAGE

CP Software is well known for its range of computer versions of classic board games

Snail Logo is an unusual release, in that it is essentially a language — a language particularly well suited for the construction of geometric patterns hence its association with the turtle

This is not the only version of the language available, but it is the first available for the Spectrum — it is the first moreover that actually has a displayable snail!

The price of £9 95 includes a manual which acts as a general introduction to the language

Program *Snail Logo*
Price *£9 95*
Micro *Spectrum 48K*
Supplier *CP Software*
17 Orchard Lane
Prestwood
Great Missenden
Bucks HP16 0NN

MINIMALIST

Some new releases deserve a minimalist approach

Gamespack Spectrum Cardgames Hangman Funfair Software

Program *Braingames*
Price *£5 00*
Micro *Spectrum 16/48K*
Supplier *Funfair Software*
82 Lees Gardens
Maidenhead
Berkshire

PREHISTORIC



If your reputation consists of *Penetrator* and *The Hobbit* it can't be easy to decide what to do next

Melbourne House has been strangely silent, at least on the Spectrum front for some months now Rumours of adventure games about (but you anything you like it isn't *Lord of the Rings*) but meanwhile something more tangible has emerged

Terror Daktil 4D is an arcade style game in which, to simplify things slightly, you fire at prehistoric birds What is unusual is the way 3D techniques are used to give you the impression the bird is rushing towards you

Although this is not unique (see *3D Tunnel* for example), great things are claimed for the graphics

Program *Terror Daktil 4D*
Price *£6 95*
Micro *Spectrum 48K*
Supplier *Melbourne House*
Glebe House
Station Road
Cheddington
Leighton Buzzard
Bedfordshire LU7 7NA

New Releases is designed to let people know what software is coming on to the market If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases, Popular Computing Weekly, 19 Whitcomb Street London WC2 7HF

Ziggurat



BCPL and Forth

A computer's memory is arranged in a linear sequence, one memory location followed by another in some numerical order

BCPL and Forth are both languages which use this ordering to good effect

BCPL like most other programming languages, can set up an array of elements Only one-dimensional arrays are provided called "vectors To make a vector of 16 elements (of name VV) the BCPL declaration would be

LET VV = VEC 15

and to distinguish the (say) 7th element of VV we write VV!7 The ' ! ' is pronounced pling in BCPL — as it is in BBC Basic (*User Guide* p409)

The BBC Basic, *VV!7* is not the same as *VV(7)* the first is the 7th element of the word vector *VV* and the second is the 7th element of the real array *VV* There are two different forms of declaration

```
10 DIM 15  REM WORD VECTOR
20 DIM VV(15)  REM REAL ARRAY
```

The BCPL declaration *Let VV = Vec 15* sets up a vector of 16 successive locations and the variable *VV* is set to the address of the first location of the vector *VV* points to the first element and *VV+1* points to the second element (ie *V+1* is the address of the second element of the vector) '!' is placed in front of the variable to produce the contents of the element stored at that location. That is, *!VV* refers to the value at the beginning of the vector (or *VV!0*) To refer to the second element along we can either write the cumbersome *!(VV+1)* or the more compact *VV!1* The content of the second element, say could itself be an address of a different location and therefore it is very easy to produce linked lists

This system corresponds exactly to the use of memory and pointers in Forth where there are elements in memory (called ' cells just as in BCPL) and each location can be regarded as itself being a pointer to other locations

Systems programming languages, such as BCPL or Forth have to provide such flexible methods of controlling memory use to be successful

BBC Basic has three forms of indirection *!*, *?*, and $

The difference between the three forms of indirection in BBC Basic is what each form considers to be its own basic element For *!* (pling) the basic element is four bytes (which exactly corresponds to an integer for the BBC) In the case of *?* (query) the basic element is one byte (*?VV* is used *inter alia*, as the BBC version of *Peek and Poke*) And finally the $ (dollar) takes as its basic element a series of locations terminated by the value hex *0D* (and treats the locations as characters) Following the *Dim VV 15* statement above we cannot refer legitimately to *VV!7* because the pling assumes four bytes a time we can refer legitimately to *VV!0* (or *!VV*) *VV!1 VV!2* and *VV!3* (or *?VV* to *VV?15*)

To indicate how this might be used, I will take an example from an article on graphics for the BBC computer The authors set up a 500 element real array (for a computing technique called a ' queue ') They effectively had written

```
1000 DIM VV(500)  REM Takes up 2500 bytes
```

which in itself took up 2 5K What numbers were they storing? They were storing co-ordinates on the high res screen (maximum value 1279) for both *X* and *Y* — 5K in all The number 1280 can be accommodated in two bytes (1280 = 5×256 + 0×1) and so why not define a byte vector 1000 bytes long? All it needs is

```
1000DIM VV 999  REM Takes up 1000 bytes
```

to save 3K overall — with an increase in speed as byte vectors are more efficient

It is true that we would have needed to define a couple of special routines to cope with two bytes at once but that is easy enough Eg to produce the number from two bytes

```
1000 DEF FNvalue(XX,I) = 256*XX?I + XX?(I+1)
```

It seems clear that many experts (often raised on a language called Pascal) do not appreciate the power of BBC Basic but get carried away by its more obvious advantages ■

Boris Allen

Puzzle

Cassette prize

Puzzle No 67

Jamie needs help with a problem He was given a set of four wooden blocks like dice only with numbers instead of dots His friend offered him a financial incentive to take more interest in the blocks Work out the sum of all the four-digit numbers possible with them and I'll give you one of my computer cassettes for every million in the total He himself had been set the puzzle by his teacher but preferred that Jamie was the one to put in the effort

Can you help Jamie? No digit can be used more than once in any number — but the six may be inverted to form a 9



Solution to Puzzle No 62

Oops! Horror of horrors, an error in the question to this puzzle!

Instead of 0 representing a zero in the seventh equation — √EEEEEEE = EEOE — O was meant to indicate an *odd* number So with the puzzle as was there was no possible solution to the seventh equation The rest of the puzzle could however be solved using a program

```
10 FOR N = 2 TO 9998 STEP 2
20 LET S = N * N
30 LET S$ = STR$ S
40 FOR F = 1 TO LEN S$
50 IF VAL (S$(F))/2   INT (VAL(S$(F))/2) <> 0 OR S$(F) = "0" THEN GOTO 80
60 NEXT F
70 PRINT "Number" N "Root" S
80 NEXT N
```

This gives the answers

√4 = 2 √64 = 8 √484 = 22 √4624 = 68 √68644 = 262 √446224 = 668 and √44462224 = 668

Winner to Puzzle No 62

The winner is C Hembrough Tweed Grove Hull who receives £10

Top 10

ZX81

1	(3)	QS Scramble	(Quicksilva)
2	(1)	Football manager	(Addictive Games)
3	(8)	Defender	(Quicksilva)
4	(2)	Flight Simulation	(Psion)
5	(4)	1K Chess	(Artic)†
6	(6)	1K Games	(Artic)†
7	(5)	Fantasy Games	(Psion)
8	(—)	Invaders	(Quicksilva)
9	(10)	Espionage Island	(Artic)
10	(—)	Invaders	(Bug-Byte)

*all 16K except where shown
†Runs in 1K
(Figures compiled by Boots & Co London)

Spectrum

1	(3)	Jet Pac	(Ultimate)
2	(4)	Flight Simulation	(Psion)*
3	(2)	Transylvanian Tower	(Richard Shepherd)*
4	(—)	Hellfoot Goes Skiing	(Penn Melbourne House)
5	(9)	3D Tanx	(DK Tronics)
6	(—)	Hellfoot and the Spiders	(Penn Melbourne House)
7	(—)	Monsters in Hell	(Softek)
8	(6)	The Hobbit	(Melbourne House)*
9	(7)	Chess	(Psion)
10	(1)	Penetrator	(Melbourne House)

*Requires 48K
(Figures compiled by WH Boots & Sons)

Atari

1	(2)	Miner 2049er	(Big Five)*
2	(—)	Triad	(Adventure International)‡
3	(—)	Wayout	(Sirius)‡
4	(—)	Close Assault	(Avalon Hill)‡
5	(—)	Suspended	(Infocom)‡
6	(3)	Zaxxon	(Datasoft)
7	(—)	Preppie 2	(Adventure International)
8	(—)	Sea Dragon	(Adventure International)
9	(7)	Hellcat Ace	(Microprose)†
10	(8)	Airstrike	(English)

*Cartridge †32K cassette ‡48K disc.
(Figures compiled by Calisto Computers Birmingham 021-632 6458)

Vic20

1	(2)	Catcha Snatcha	(Imagine)
2	(4)	Wacky Waiters	(Imagine)
3	(1)	Arcadia	(Imagine)
4	(3)	Cosmiads	(Bug-Byte)
5	(7)	Asteroids	(Bug-Byte)
6	(8)	Pixie	(Bug-Byte)
7	(6)	Race	(Commodore)
8	(9)	Amok	(Audiogenic)
9	(—)	Alien Blitz	(Audiogenic)
10	(—)	Chess	(Bug-Byte)

(Figures compiled by Boots & Co London)

BBC*

1	(1)	Snooker	(Acornsoft)
2	(2)	Starship Command	(Acornsoft)
3	( )	Cresta	(Computer Concepts)
4	(10)	Killer Gorilla	(Program Power)
5	(—)	Missile Base	(Acornsoft)
6	[illegible]	Bug Bomb	(Virgin Games)
7	(5)	Great Britain Limited	(Simon W Hessel)
8	(4)	Moonraider	(Program Power)
9	(—)	Forth	(Acornsoft)
10	(—)	Logo2	(Computer Concepts)

*Model B only
(Figures compiled by Poggles Micro Management, Ipswich 0473 58181)

Books

1	(4)	Commodore 64 Programmers Reference Guide *Commodore*	(Commodore)
2	(1)	Structured Programming with BBC Basic *Atherton*	(Norwood)
3	(2)	Assembly Language for the BBC Micro *Birnbaum*	(Macmillan)
4	(—)	6502 Machine-code for Beginners *Stephenson*	(Newnes)
5	(9)	Complete Spectrum Rom Disassembly *Logan*	(Melbourne House)
6	(—)	BBC Micro Book Basic Sound and Graphics *McGregor*	(Addison Wesley)
7	(6)	6809 Assembly Language Programming *Leventhal*	(Osborne)
8	(10)	Forth on Your BBC Microcomputer *de Grandis-Harrison*	(Acornsoft)
9	(7)	Vic Programmer's Reference Guide *Commodore*	(Commodore)
10	(—)	Z80 Assembly Language Subroutines, *Leventhal*	(Osborne)

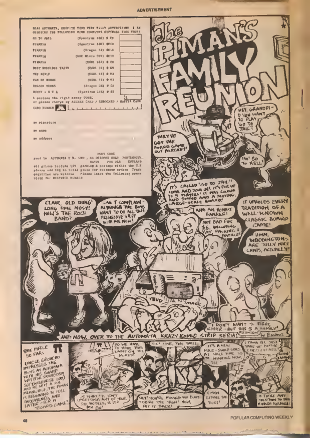
(Figures compiled by Watford Technical Books, Watford 0923 23324)

Dragon

1	(—)	Mountain	(Dragon Data)
2	(—)	Basic Tutorial	(Ampalsoft)
3	(—)	Personal Finance	(Dragon Data)
4	(—)	Special Collection 1	(Dragon Data)
5	(1)	The King	(Microdeal)
6	(3)	Talking Android Attack	(Microdeal)
7	(4)	Planet Invasion	(Microdeal)
8	(2)	Space War	(Microdeal)
9	(5)	Night Flight	(Salamander)
10	(6)	Dragon Trek	(Wintersoft)

(Figures compiled by Boots & Co London)

(Last week's position in brackets)


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THE BIBLE (ZX81 1K) @ £3
CAN OF WORMS (ZX81 1K) @ £3
DRAGON SERIES (Dragon 32) @ £5
BUNNY + E T A (Spectrum 16K) @ £5
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CLAIR, OLD THING! LONG TIME NOSY! HOW'S THE ROCK BAND?
CAN'T COMPLAIN - ALTHOUGH THE BOYS WANT TO DO ALL THIS PROGRESSIVE STUFF WITH ME NOW!
THUD
SMACK
I DON'T WANT TO FIGHT, EITHER - BUT THIS IS A 'FAMILY REUNION'!
AND NOW, OVER TO THE AUTOMATA KRAZY KOMIC STRIP SERIAL by Evans
THE PIFFLE SO FAR: UNCLE GROUCHO IMPRESSES THE BOYS AT AUTOMATA WITH HIS SHARP WIT (FOR SPOONERISM SEE 'ENTERPRISE LOO') AND HE GETS A JOB. MEANWHILE, THE PIMAN IS BEGINNING TO FEEL THREATENED, AND LATER OVER A 'BOARD GAME'
DO WE HAVE TO HAVE THIS LAMP ON THE BOARD?
SO WHAT? IT ISN'T UPSETTING ANY OF YOUR 20 HOTELS, IS IT? MY GO!
SIX! ONE, TWO, THREE
HEY! YOU'RE MOVING MY BOOT. YOU'RE THE IRON! NOW, PUT IT BACK!
IT'S A NEW RULE - SWAP SIDES AT HALF TIME SO I'M WINNING NOW, SEE?
C'MON GIMME THE BOOT!
I THINK I'LL JUST TAKE UP BOXING